Exhibit 2

THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of:	Itzhak Gurantz et al.
U.S. Patent No.:	7,594,249 B2
Issue Date:	September 22, 2009
Appl. Serial No.:	09/910,412
Filing Date:	July 21, 2001
Title:	NETWORK INTERFACE DEVICE AND BROADBAND LOCAL AREA NETWORK USING COAXIAL CABLE

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PETITION FOR *INTER PARTES* REVIEW OF UNITED STATES PATENT NO. 7,594,249 PURSUANT TO 35 U.S.C. §§311–319, 37 C.F.R. §42

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EXHIBITS

DISH-1001	U.S. Patent 7,594,249 to Gurantz *et al.* (“the ’249 patent”)
DISH-1002	Excerpts from the Prosecution History of the ’249 Patent (“the Prosecution History”)
DISH-1003	Declaration of Dr. Scott Acton
DISH-1004	Curriculum Vitae of Dr. Scott Acton
DISH-1005	U.S. Patent 7,127,734 to Amit et al. (“Amit”)
DISH-1006	Excerpts from Dennis J. Rauchmayer, *ADSL/VDSL Principles*, 1999 (“ADSL/VDSL”)
DISH-1007	Jacobsen et al., *An Efficient Digital Modulation Scheme for Multimedia Transmission on the Cable Television Network*, 43rd Annual National Cable Television Association Convention and Exposition, New Orleans, LA. 1994 (“Jacobsen”)
DISH-1008	Excerpts from Walter Y. Chen, *DSL: Simulation Techniques and Standards Development for Digital Subscriber Lines*, 1998 (“DSL Simulation Techniques”)
DISH-1009	Proof of Service of Summons and Complaint on DISH Network Corporation in *Entropic Communications, LLC v. DISH Network Corporation et al.*, Case 2:23-cv-01043, ECF No. 14 (C.D. Cal. Feb. 23, 2023)
DISH-1010	Weinberg, G. (1972). Cost Analysis of CATV Components. Final Report. (“Weinberg”)
DISH-1011	Dodds, D. E., & Swanson, L. (1999, August). Simultaneous voice and Internet data on rural subscriber lines. In 1999 IEEE Pacific Rim Conference on Communications, Computers and Signal Processing (PACRIM 1999). Conference Proceedings (Cat. No. 99CH36368) (pp. 18-21). IEEE. (“Dodds”)

DISH-1012	Maxemchuk, N., & Netravali, A. (1985). Voice and Data on a CATV Network. IEEE Journal on Selected Areas in Communications, 3(2), 300-311 ("Maxemchuk")
DISH-1013	Jacobsen, K. S. (1997, November). Synchronized Discrete Multi-Tone (SDMT) Modulation for Cable Modems: Making the Most of the Scarce Reverse Channel Bandwidth. In WESCON/97 Conference Proceedings (pp. 374-380). IEEE. ("Jacobsen-2")
DISH-1014	Fryxell, D., Lanning, S., & Sirbu, M. (1999). Broadband Access Networks and the Emergence of Voice over IP (VoIP): an Economic Analysis for Cable and ADSL. In 27th Annual Telecommunications Policy Research Conference, Alexandria, VA ("Fryxell")
DISH-1015	Lipoff, S. J. (1994). Personal communications networks bridging the gap between cellular and cordless phones. Proceedings of the IEEE, 82(4), 564-571 ("Lipoff")
DISH-1016	S. Ovadia, "Advanced upstream CATV access technologies and standards," 1999 Digest of the LEOS Summer Topical Meetings: Nanostructures and Quantum Dots/WDM Components/VCSELs and Microcavaties/RF Photonics for CATV and HFC Systems (Cat. No.99TH8455), San Diego, CA, USA, 1999, pp. IV35-IV36 ("Ovadia")
DISH-1017	Roden, M. S. (1985). Analog and digital communication systems. Prentice-Hall, Inc. ("Roden")
DISH-1018	Jorasch, R., & Price, K. (1988, March). Advanced satellite system architecture for VSATs with ISDN compatibility. In 12th International Communication Satellite Systems Conference ("Jorasch")
DISH-1019	Smalley, D. (1994). Equalization concepts: a tutorial. Atlanta Regional Technology Center, Texas Instruments ("Smalley")

DISH-1020	Santella, G., & Mazzenga, F. (1998). A hybrid analytical-simulation procedure for performance evaluation in M-QAM-OFDM schemes in presence of nonlinear distortions. IEEE Transactions on Vehicular Technology, 47(1). ("Santella")
DISH-1021	Corvaja, R., Costa, E., & Pupolin, S. (1998, October). Analysis of M-QAM-OFDM transmission system performance in the presence of phase noise and nonlinear amplifiers. In 1998 28th European Microwave Conference (Vol. 1, pp. 481-486). IEEE.
DISH-1022	Declaration of June Munford
DISH-1023	Excerpts from the Prosecution History of U.S. Patent 7,127,734 to Amit ("the Amit Prosecution History")
DISH-1024	Federal Court Management Statistics for September 2023 published by the Administrative Office of the U.S. Courts, retrieved from https://www.uscourts.gov/sites/default/files/data_tables/fcms_na_distcomparison0930.2023.pdf
DISH-1025	Order Granting Stipulation Setting Claim Construction Schedule, *Entropic Communications, LLC v. DISH Network Corporation et al.*, Case 2:23-cv-01043-JWH-KES (CDCA)
DISH-1026	LegalMetric Time to Trial Report, Central District of California, Patent Cases (Jan. 2023 – Nov. 2023)

LISTING OF CLAIMS

Claim 1	
[1.pre]	A signal distribution network comprising:
[1.a]	a filter located at the point of entry of a building tuned to reject network signals originating in the building, such that the network signals originating in the building do not pass through the filter, but rather are reflected back into the building;
[1.b.i]	at least one signal splitter,
[1.b.ii]	the signal splitter having a common port and a plurality of tap ports, the common port of the signal splitter being coupled to the filter; and
[1.c.i]	a plurality of terminal devices,
[1.c.ii]	each terminal device being coupled to a tap port of at least one signal splitter,
[1.c.iii]	at least one of the terminal devices providing frequency bins with more transmit bits which occupy parts of the channel where the signal to noise ratio (SNR) is high;
[1.d]	wherein the reflections from the filter provide a path for terminal devices back through the tap port of the signal splitter and out each

	other tap port to transmit signals to other terminal devices thus allowing terminal devices to communicate directly with each other to form the signal distribution network.
Claim 2	
[2]	The signal distribution network of claim 1, wherein at least one of the communication channels between terminal devices uses time division duplex protocol for communications and the communications are synchronized by broadcasting a beacon message on the network.
Claim 3	
[3]	The signal distribution network of claim 2, wherein the power level of each OFDM carrier is adjusted according to the signal loss at each OFDM carrier frequency to overcome frequency selective channel impairments caused by the reflections from the filter.
Claim 4	
[4]	The signal distribution network of claim 1, wherein the signal modulation used by the terminal devices is orthogonal frequency division multiplexing (OFDM) and the modulation order of each OFDM carrier is adjusted according to the signal to noise ratio (SNR)

	at each OFDM carrier frequency to overcome frequency selective channel impairments caused by the reflections from the filter.
Claim 5	
[5.pre]	A broadband local area network using coaxial cable building wiring as a communication channel, the network comprising:
[5.a.i]	a plurality of terminal devices,
[5.a.ii]	each terminal device communicating with other terminal devices using orthogonal frequency division multiplexing (OFDM) modulation,
[5.a.iii]	at least one of the terminal devices providing frequency bins with more transmit bits which occupy parts of the channel where the signal to noise ratio (SNR) is high;
[5.b]	a network of building cables coupled to the plurality of terminal devices; and
[5.c.i]	a filter having a first and second port, the first port connected to a building point of entry and the second port connected to the plurality of terminal devices via the network of building cables,
[5.c.ii]	wherein signals transmitted by any of the terminal devices and received at the second port of the filter are rejected by the filter such that such signals do not pass through the filter, but rather are reflected

	back into the network of building cables in order to create a communication path between the transmitting terminal device and at least one other terminal device coupled to the network of building cables.
Claim 6	
[6]	The broadband local area network of claim 5 wherein the modulation order of each OFDM carrier is adjusted according to the signal to noise ratio (SNR) at each OFDM carrier frequency to overcome frequency selective channel impairments present in the coaxial building wiring caused by the reflections from the filter.
Claim 7	
[7]	The broadband local area network of claim 5, wherein the power level of each OFDM carrier is adjusted according to the signal loss at each OFDM carrier frequency to overcome frequency selective channel impairments present in the coaxial building wiring caused by the reflections from the filter.
Claim 8	
[8]	The broadband local area network of claim 5 wherein the frequency used for communicating is above the cable television band.

Claim 9	
[9]	The broadband local area network of claim 5, wherein at least one of the communication channels between terminal devices uses time division duplex protocol for communications and the communications are synchronized by broadcasting a beacon message on the network.
Claim 10	
[10.pre]	A broadband local area network for transmitting modulated signals using coaxial cable building wiring containing a plurality of branches comprising:
[10.a]	a filter located at the point of entry of the building wiring that rejects network signals originating in the building wiring such that the rejected network signals do not pass through the filter, but rather are reflected by the filter back into all branches of the building wiring;
[10.b]	at least one signal splitter;
[10.c.i]	a plurality of terminal devices connected to the wiring branches,
[10.c.ii]	each terminal device capable of communicating with other terminal devices [using][1] the reflected signal path created by the filter,

[1] The word "using" was included when this claim was amended. DISH-1002, STAMP-65.

[10.c.iii]	wherein the terminal devices perform equalization on the received signal that restores a flat frequency response to overcome communication channel impairments caused by the reflected signals.
Claim 11	
[11]	The network of claim 10 wherein the equalization is frequency domain equalization.
Claim 12	
[12]	The network of claim 10 wherein the equalization is time domain equalization.
Claim 13	
[13]	The network of claim 10 wherein the equalization is adaptive.
Claim 14	
[14]	The network of claim 13 wherein the terminal devices use orthogonal frequency division multiplexing (OFDM) modulation to overcome the communication channel impairments caused by the reflected signals.
Claim 15	
[15]	The network of claim 14 wherein the terminal devices use forward error correction to recover the transmitted signals without errors.

Claim 16	
[16]	The network of claim 10 wherein the terminal devices use orthogonal frequency division multiplexing (OFDM) modulation to overcome the communication channel impairments caused by the reflected signals.
Claim 17	
[17]	The broadband local area network of claim 10, wherein at least one of the communication channels between terminal devices uses time division duplex protocol for communications and the communications are synchronized by broadcasting a beacon message on the network.

I. INTRODUCTION

After 3 years of prosecution and 7 office actions, the ’249 patent was only allowed because the claimed “filter” was amended to “**reject** network signals originating in the building, such that the network signals … are **reflected** back into the building” for device-to-device communication.

Amit also uses a filter to “**reject** … a certain RF range that is used by the home networking devices,” where the “filter **reflection**” is used as the “main signal” for device-to-device communication. Indeed, an unrelated party’s petition recently led to the reexamination of claim 10 based on Amit combined with other references.

This petition combines Amit with unique references and attacks all 17 of the patent’s claims (the “Challenged Claims”). IPR is thus warranted under 35 U.S.C. §§311–319 and 37 C.F.R. §42.

II. REQUIREMENTS FOR IPR—37 C.F.R. §42.104

A. Grounds for Standing—37 C.F.R. §42.104(a)

Petitioner is not barred or estopped from requesting review and certifies the ’249 patent is available for IPR. This Petition is filed within one year of a complaint’s service. DISH-1009.

B. Challenge and Relief Requested—37 C.F.R. §42.104(b)

This Petition demonstrates a reasonable likelihood of prevailing on at least one Challenged Claim and requests cancellation of all Challenged Claims on the grounds below.

Ground	Patent Claims	Basis
1	**1-2**	§103: Amit
2	**1-17**	§103: Amit-ADSL/VDSL
3	**1-2, 4-6, 8-10, 12-14, 16-17**	§103: Amit-Jacobsen
4	**2-3, 7, 9-13, 15, 17**	§103: Amit-Jacobsen-DSL-Book

Each reference pre-dates 2001-05-04 ("Critical Date")—the earliest possible priority date.[2]

Reference	Prior Art Date (at least as early as)	Basis (at least under)
Amit US7,127,734 (DISH-1005)	2000-04-12	§102(e)
ADSL/VDSL (DISH-1006)	1999	§102(b)
Jacobsen (DISH-1007)	1994	§102(b)
DSL-Book (DISH-1008)	1998	§102(b)

[2] Petitioner does not concede the claimed priority.

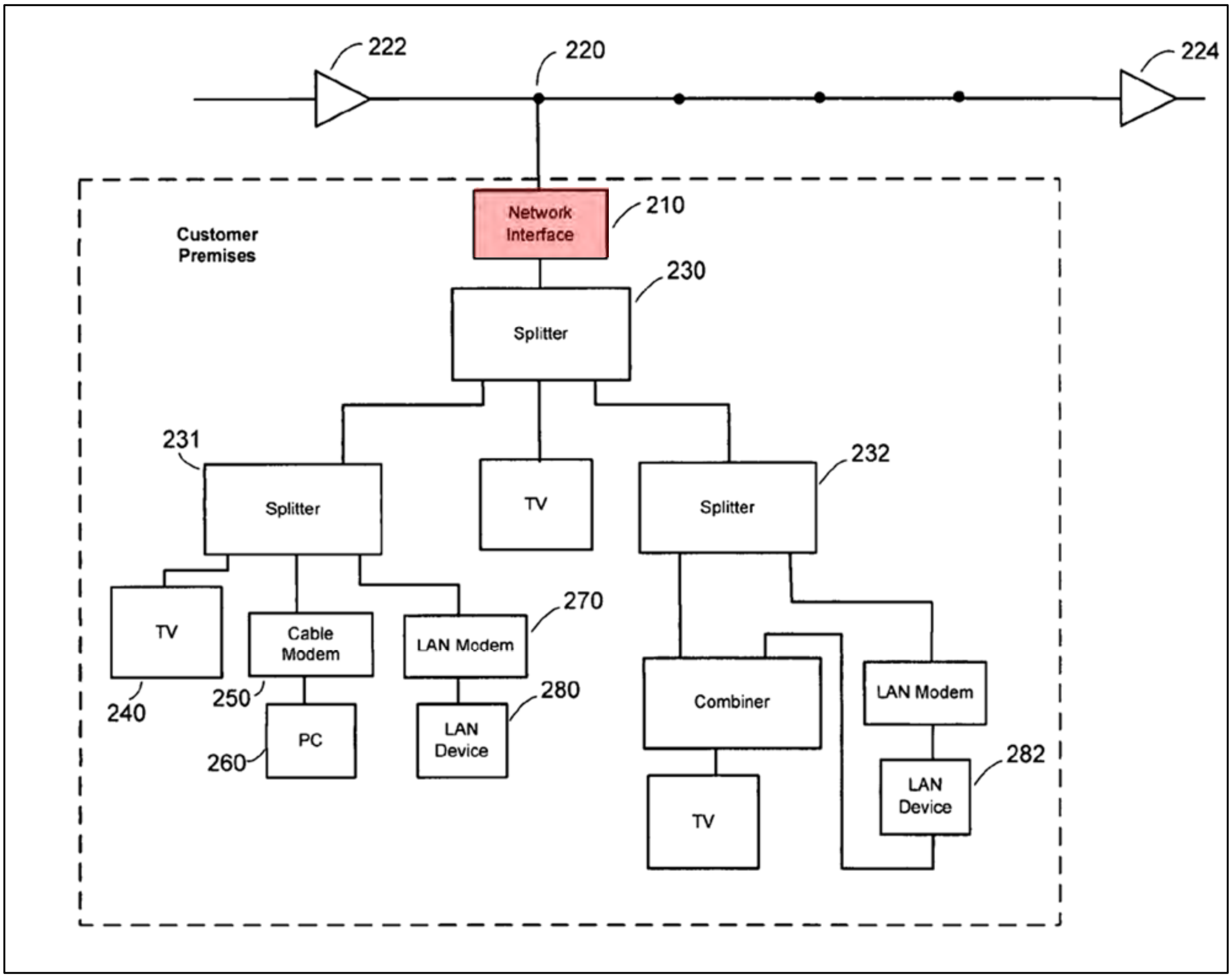
C. Claim Construction—37 C.F.R. §42.104(b)(3)

The Challenged Claims are obvious under any reasonable interpretation, so no express constructions are required. Petitioner reserves the right to address any proposed constructions and to pursue district court constructions regarding noninfringement.

III. THE ’249 PATENT

A. Summary

The ’249 patent relates to “[a] local area network [that] uses coaxial cable wiring for interconnection of terminal devices” where “[a] frequency selective network interface device is placed at the building point of entry … to reflect network signals transmitted by terminal devices back into the building distribution to be received by other terminal devices.” DISH-1001, Abstract.



’249 Patent, FIG. 2 (Annotated).

The claimed network interface device is a filter, such as “a passive filter.” *Id.*, 5:35-36.

The patent admits most of the claimed elements were known. In prior coaxial LANs, “communication between nodes occurs over a shared coaxial cable” where “[s]ignal splitters are used to distribute downstream signals from the point of entry (POE) to the various terminals” and “upstream signal transmitted by the

terminal device flows through the signal splitters back to the POE." *Id.*, 1:20-35. These prior networks used TDMA (*id.*, 2:57-59) and OFDM "to overcome the frequency selective channel impairments present in coaxial building wiring." *Id.*, 3:1-3, 7:61-8:11, 8:50-60.

Two problems purportedly remained—"tap port-to-port isolation and providing a suitable signal path for terminal-to-terminal communication." *Id.*, 3:4-7.

B. Prosection History

The '249 patent issued from Patent App. 09/910,412 filed 2001-07-21 and Provisional 60/288,967 filed 2001-05-04. The most notable events from the three-year prosecution appear below. DISH-1003, ¶¶36-40.

After the fifth Office Action, the Applicant referred to "bitloading" (8:22-29) and "power control" (8:30-37) as "two techniques … for dealing with the variable nature of the interference that occurs." DISH-1002, STAMP-68.[3]

After two more Office Actions, the "filter" was amended to "reject network signals originating in the building, such that the network signals … do not pass through the filter, but rather are reflected back into the building." *Id.*, STAMP-28-STAMP-30. The Applicant argued the prior art "is not **tuned to reject** signals that

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[3] Stamped page numbers are cited as STAMP-#.

originate in the building" but instead "takes those signals in and loops them back out after processing," requiring "significantly more" hardware. *Id.*, STAMP-33 (emphasis unaltered).

A Notice of Allowance followed. *Id.*, STAMP-1-STAMP-6.

C. Level of Ordinary Skill in the Art

A POSITA would have had a Bachelor's degree in electrical engineering, computer engineering, or a related field, and 2-3 years of experience in design or development of signal processing and communication systems or networks. DISH-1003, ¶¶17-18. Additional education could substitute for professional experience, or vice-versa. *Id.*

IV. THE CHALLENGED CLAIMS ARE UNPATENTABLE

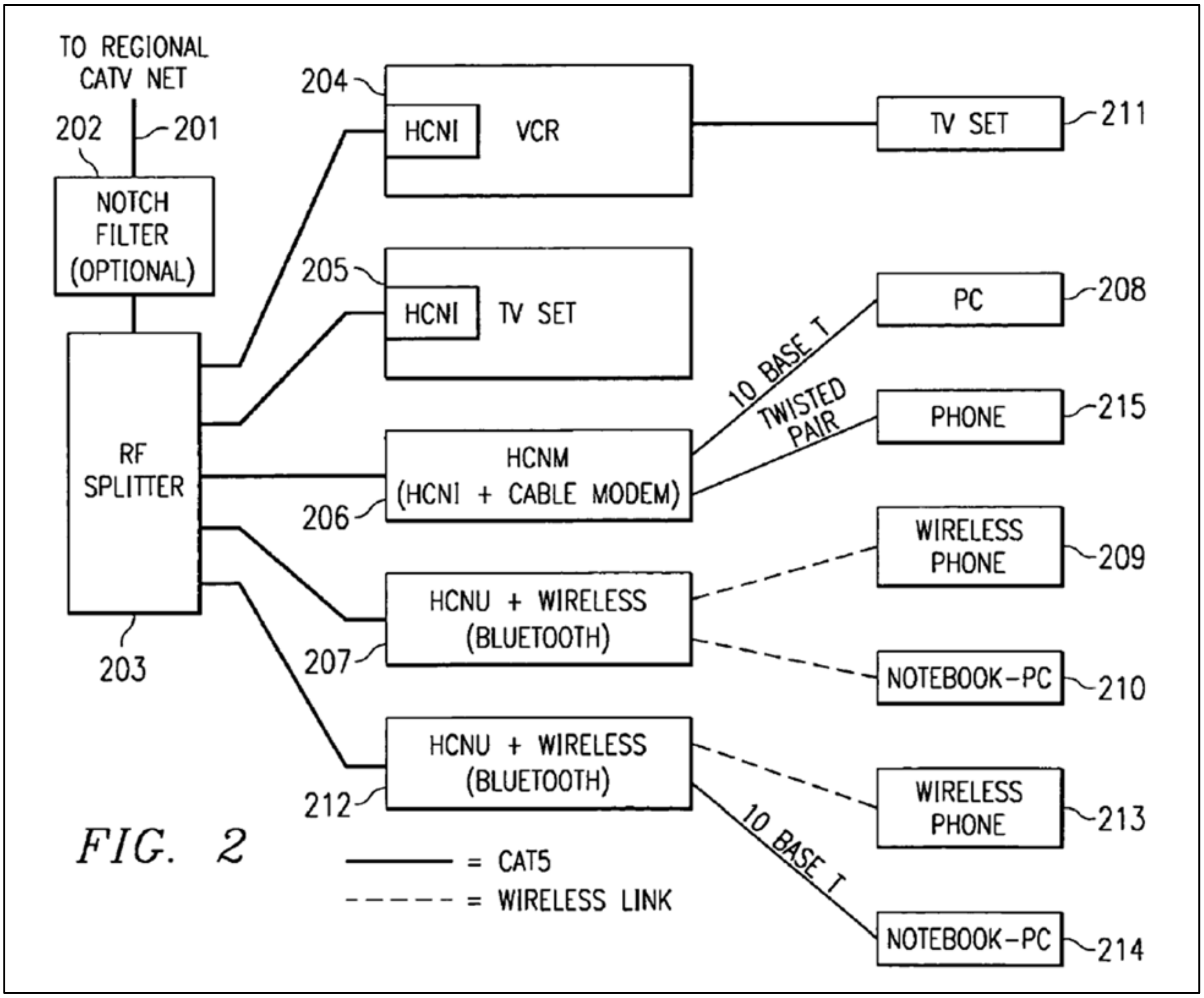
A. GROUND 1: Claims 1-2 are Rendered Obvious by Amit

1. Overview of Amit

Titled "System and methods for home network communications," Amit was filed on 2000-04-12 and qualifies as prior art under at least 102(e). DISH-1003, ¶¶41-44.

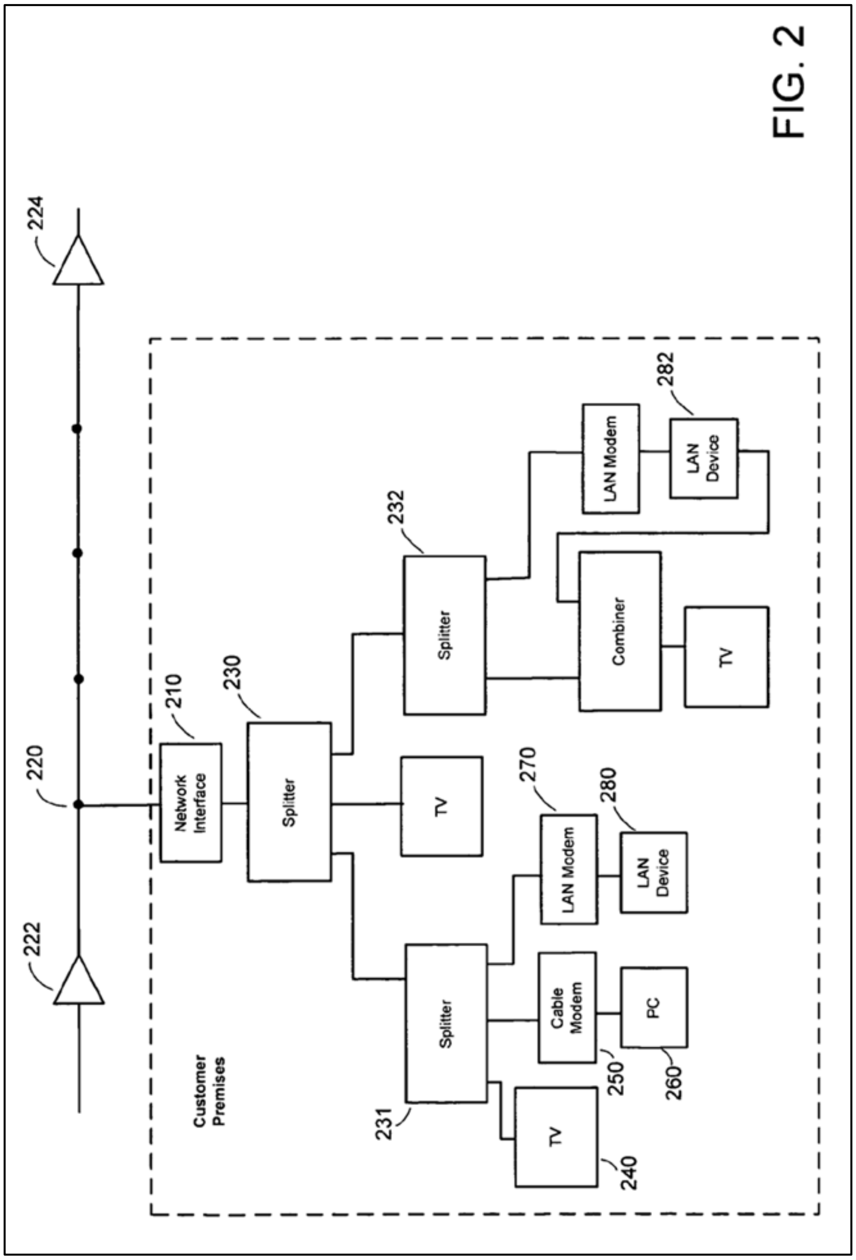
Like the '249 patent, Amit teaches of "home networking over coaxial TV cables" that "is based on direct communications between two subscribers' devices, without transferring the data via a headend." DISH-1005, 2:34-65. This is

possible because the "signals will typically propagate between the devices via reflections from other devices in the line." *Id.*, 3:19-23.



Amit, FIG. 2.

Amit's Figure 2 closely resembles the '249 patent's Figure 2:



’249 Patent, FIG. 2.

In Amit’s network, “**a filter is connected to the splitter**” to “insure[] that the home networking signals in a specific home **will not interfere with or be**

interfered by other home networks." DISH-1005, 4:30-39.[4] The signals are reflected by the filter, and "[t]he reflection from the notch filter[5] is in the power of the signal or it might be higher," allowing "this reflection [to be] our main signal." *Id.*, 14:1-5. Amit thus solves both problems the '249 patent identified—"tap port-to-port isolation and providing a suitable signal path for terminal-to-terminal communication in a coaxial cable wired building." DISH-1001, 3:4-7.

2. Claims 1-2

(a) Claim 1

[1.pre]

If the preamble is limiting, Amit discloses or renders obvious [1.pre]. DISH-1003, ¶¶45-47. Amit "provides a system and methods for communication between subscribers' devices over cable infrastructure designed to carry video signals," including "home networking solutions that utilize in-home TV wiring for supplying high rate connectivity between any two home networking nodes." DISH-1005, 2:34-46. Exemplary signal distribution networks are depicted in Figures 2 and 7. *Id.*, 5:22-31.

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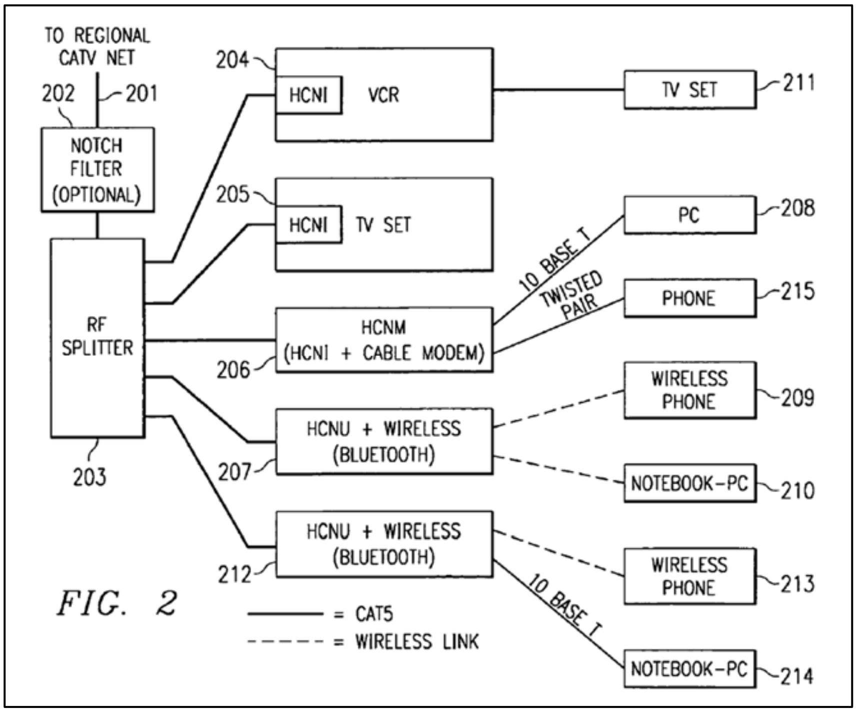
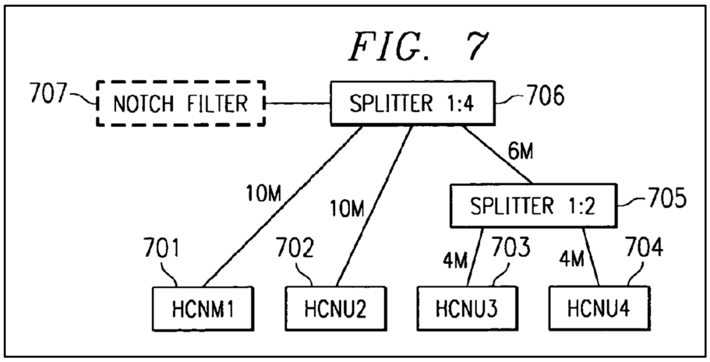
[4] All emphasis added unless otherwise stated.
[5] The '249 Patent's filter can also be a "notch filter." DISH-1001, 5:40-41.





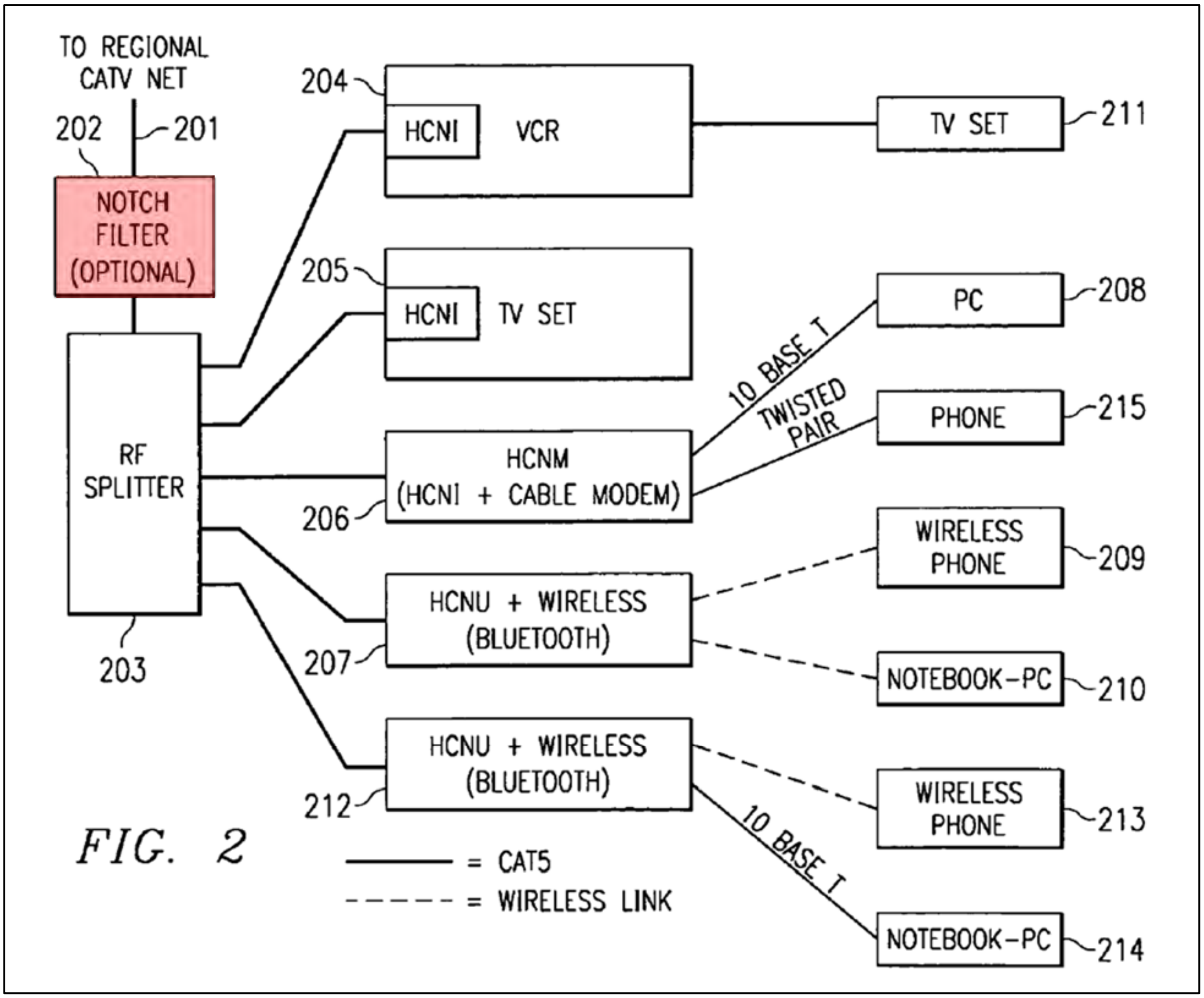
Amit, FIGs. 2, 7.

[1.a]

Amit discloses or renders obvious [1.a]. DISH-1003, ¶¶48-55. Amit explains that "the splitter at the input to the user premises is replaced by a special splitter device [comprising a filter] … or [alternatively] a filter is connected to the splitter" to "insure[] that the home networking signals **in a specific home** will not

interfere with or be interfered by **other home networks**." *Id.*; DISH-1005, 4:30-42. "This passive filter provides a 'single home' operational mode that allows for … frequency re-use," meaning the "same frequency range is allocated to different users in a CATV plant" and the filter prevents interference. DISH-1005, 3:31-36, 4:37-39. In this "Single Home operation mode … a notch filter should be added … at the flat/single home entrance," enabling "notch filter reflection," wherein the filter rejects and reflects signals originating in the building such that they do not pass through the filter, allowing the same frequency range to be used by multiple households. *Id.*, 3:33-35, 13:31-45.

The disclosures related to Figure 2 further demonstrate [1a].

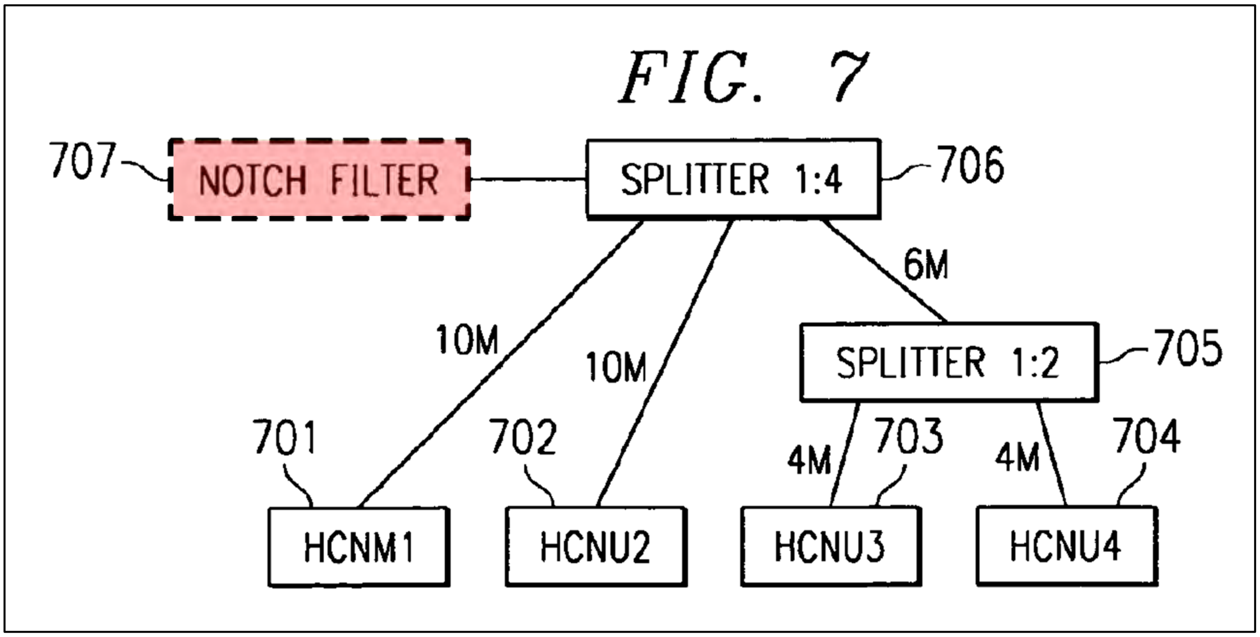


Amit, FIG. 2 (Annotated).

Amit's notch filter [202] "is connected to the regional CATV plants via cable [201]," and "RF Splitter [203] splits the signal" to devices [204-207, 212], indicating that the filter and splitter are located at the point of entry of a building, which Amit refers to as "the input to the user premises." *Id.*, 6:26-39, 4:31; DISH-1003, ¶52 (citing DISH-1010-DISH-1011). Moreover, "[n]otch filter [202], is a band reject filter that does not pass a certain RF range that is used by the home

networking devices [204–207, 212].” DISH-1005, 6:29-31. Instead, the filter reflects that RF range back into the building. *Id.*; DISH-1003, ¶52 (citing DISH-1012). Indeed, Amit explains “notch filter reflection” and that the “reflection from the notch filter is in the power of the signal or it might be higher.” DISH-1005, 13:45-14:3. “When this reflection is higher than the signal,” Amit explains that “we can use this reflection as our main signal.” *Id.*, 14:3-5.[6]

Amit’s Figure 7 disclosures separately demonstrate [1a].



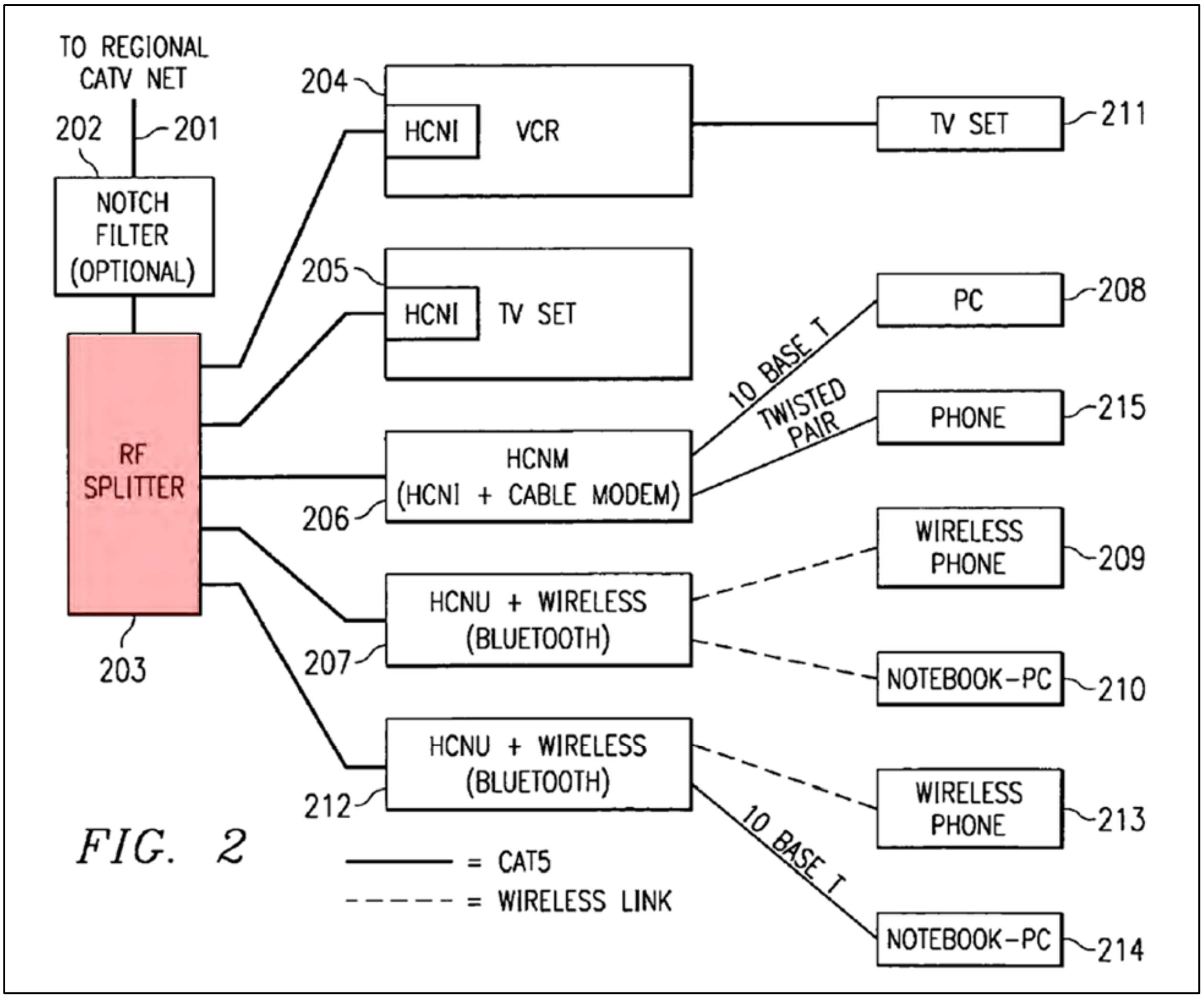
Amit, FIG. 7.

[6] These teachings do not merely apply to the Figure 7 embodiment, which is used as an example. DISH-1005, 13:65 (“**e.g.** FIG. 7”). Amit teaches that every embodiments’ terminal devices may communicate using reflections off devices, including the splitter or the notch filter. *Id.*, 3:19-32 (“reflections from other devices, **e.g.** splitters or amplifiers”); 6:39-60; 13:45 (“notch filter reflection”); 14:1-65 (calculating losses for reflections off splitters or notch filters).

Amit explains that "the communication between 703 and 704 might be 'hidden' from 701 in particular when the notch filter [707] does not exist." *Id.*, 13:65-67, 14:8-65. But, "for homes that have [a] notch filter," "Two Modems in the Same Flat" (*i.e.*, the same location) can communicate via the "[e]cho from the notch filter," and the corresponding signal loss in this filter-reflection signal path can be calculated. *Id.*, 14:8-65.

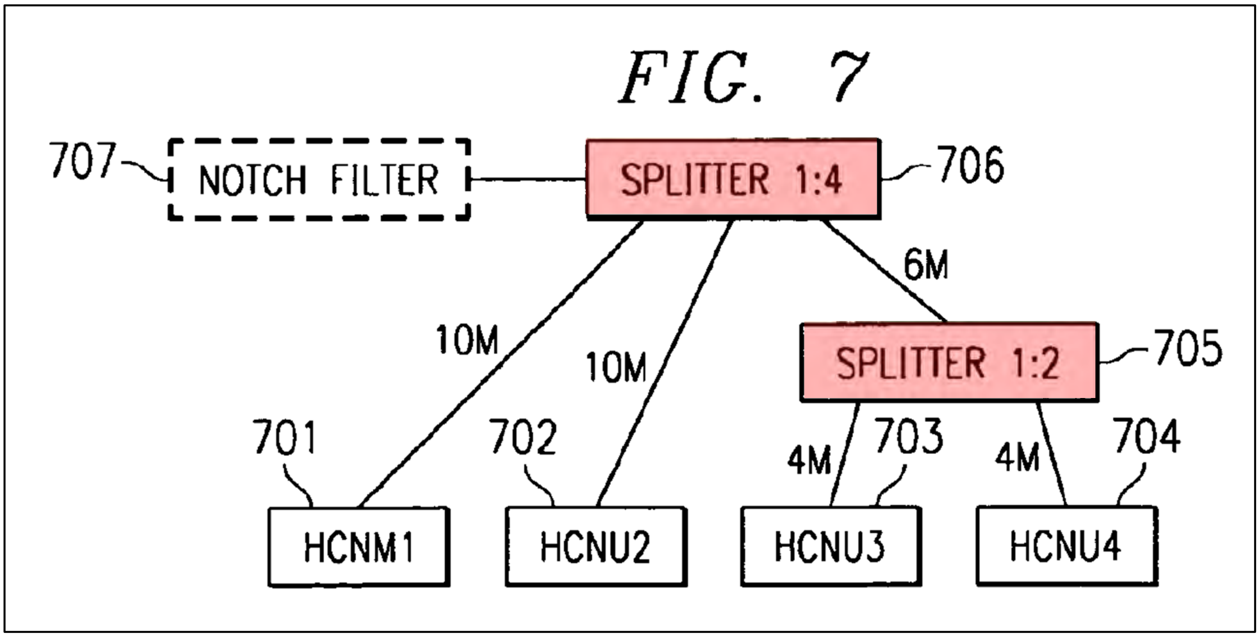
[1.b.i]

Amit discloses or renders obvious [1.b.i]. DISH-1003, ¶¶56-59. For example, in Figure 2, "RF splitter [203] splits the signal coming from and to the regional CATV plant [201], to the signals coming to and from units [204–207, 212] respectively." DISH-1005, 6:36-39.



Amit, FIG. 2.

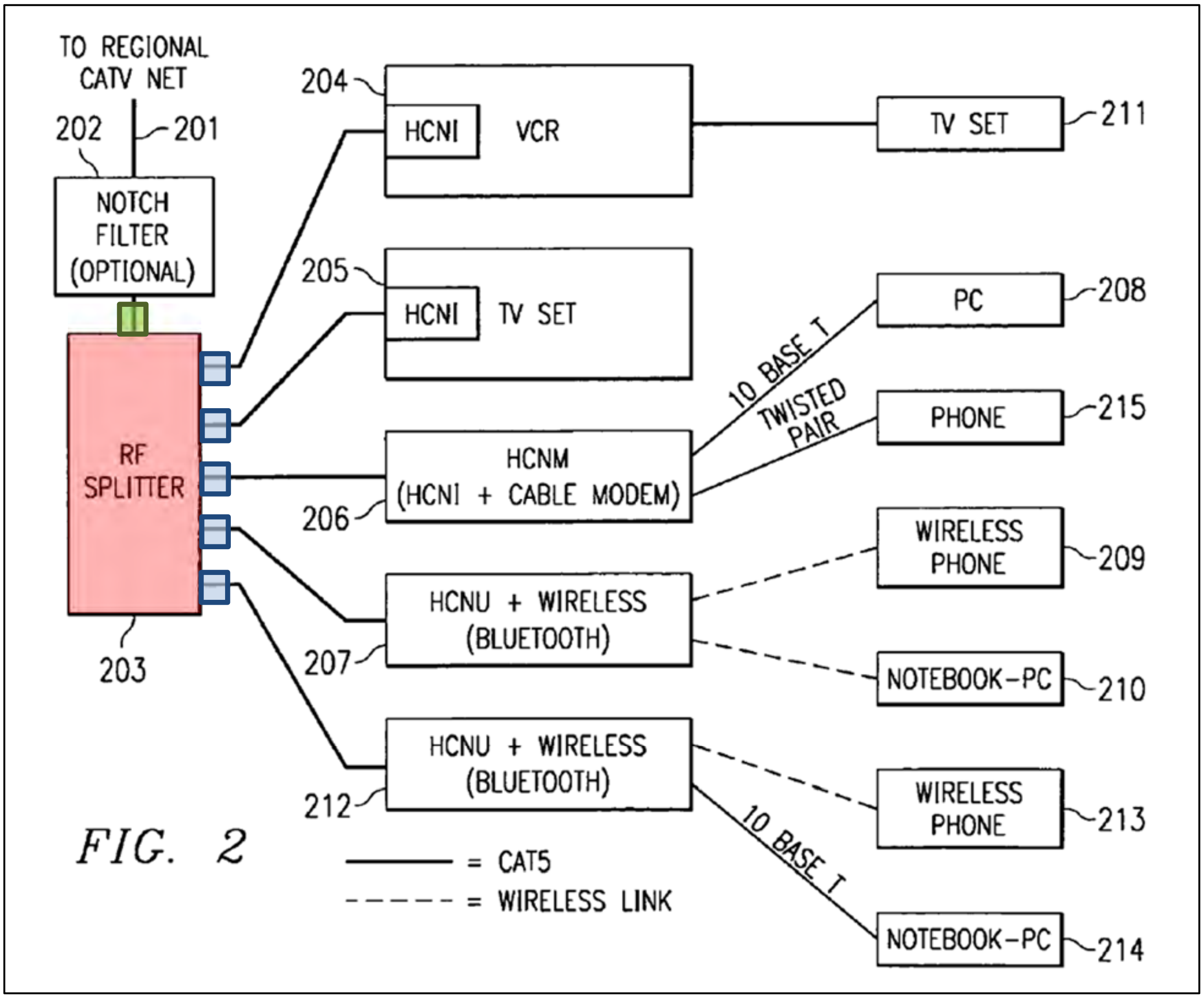
Likewise in Figure 7, the network includes two splitters [705-706]. *Id.*, 5:31.



Amit, FIG. 7 (Annotated).

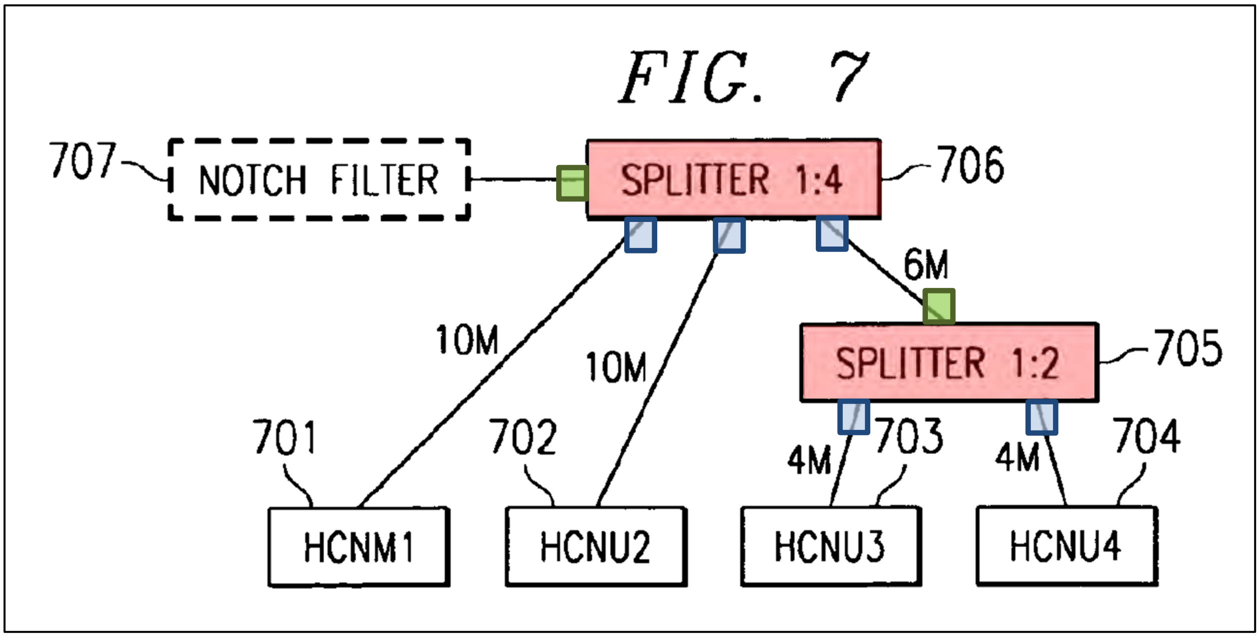
[1.b.ii]

Amit discloses or renders obvious [1.b.ii]. DISH-1003, ¶¶60-67. In Figure 2, a POSITA would have understood that the lines connecting the splitter [203] to upstream filter [202] and to downstream units [204–207, 212] teach that the splitter has a common port (input, green below) coupled to the filter [202] and a plurality of tap ports (outputs, blue below). DISH-1005, 6:36-39; DISH-1003, ¶63.



Amit, FIG. 2 (Annotated).

Figure 7 similarly teaches that each splitter has a common port coupled to the notch filter [707] and a plurality of tap ports.



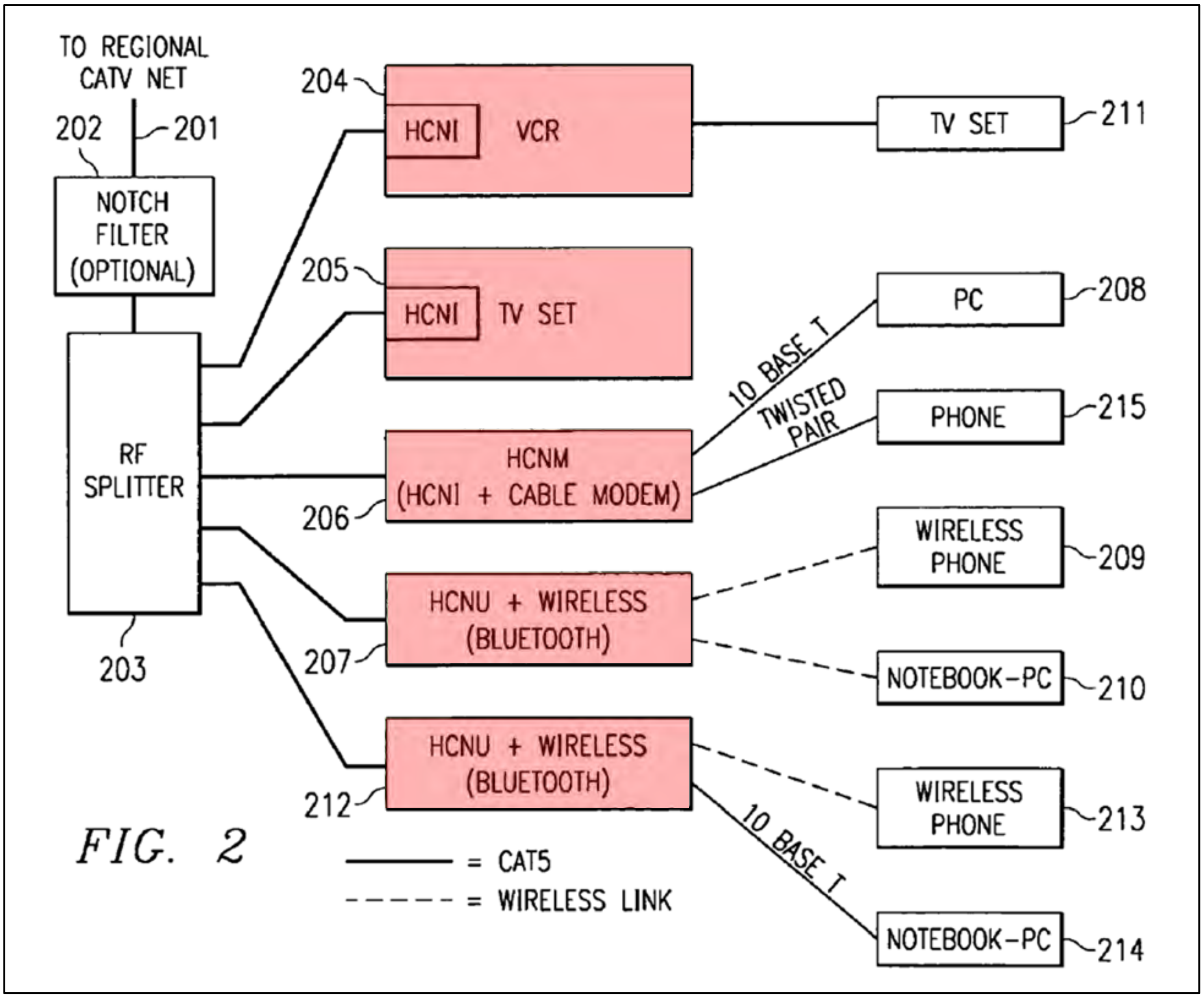
Amit, FIG. 7 (Annotated).

[1.c.i]

Amit discloses or renders obvious [1.c.i]. DISH-1003, ¶¶68-74. The ’249 patent explains that “terminal devices, such as LAN modem 270, can receive a signal transmitted by another terminal device connected to the LAN wiring forming the network.” DISH-1001, 3:66-4:2. Amit describes its networks as “provid[ing] home networking solutions that utilize in-home TV wiring for supplying high rate connectivity between any two home networking nodes.” DISH-1005, 2:44-46. A POSITA would have understood that Amit’s nodes are “terminal devices” as used in the ’249 patent. DISH-1003, ¶72.

For example, “FIG. 2 shows a Home Cable network[] (HomeCN/HCN) that has 5 nodes [204–207, 212],” which Amit also refers to as “home networking

devices," "units," and "home units." *Id.*, 6:26-41.

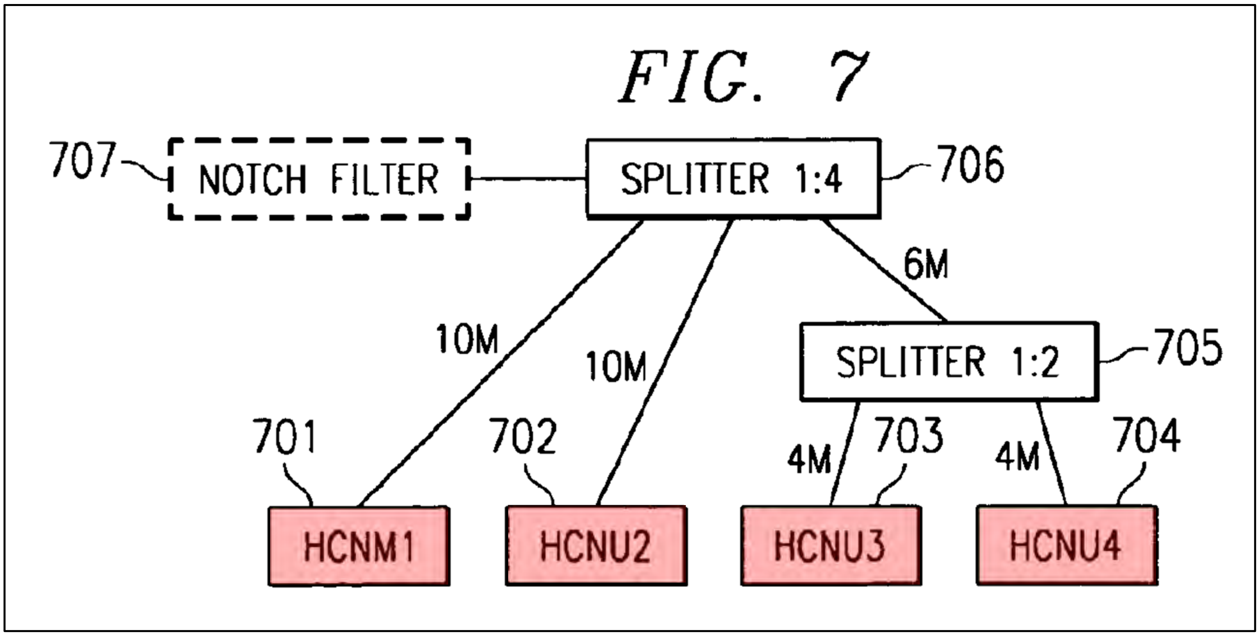


Amit, FIG. 2 (Annotated).

Amit's nodes include both VCR [204] and TV Set [205] having "Home Cable Networking Interface (HCNI) devices," as well as "Home Networking Cable Modem (HNCM) device [206]" and "HCNU+wireless units [207, 212]." *Id.*, 6:44-54. "The HCNU devices are capable of transmitting and receiving digital communications signals between them," and "[t]he HNCI's, the HCNU's and the

HNCM use Home Cable Network Protocol HCNP" to communicate. *Id.*, 6:57-64.

Figure 7 similarly shows a plurality of terminal devices [701-704].



Amit, FIG. 7 (Annotated).

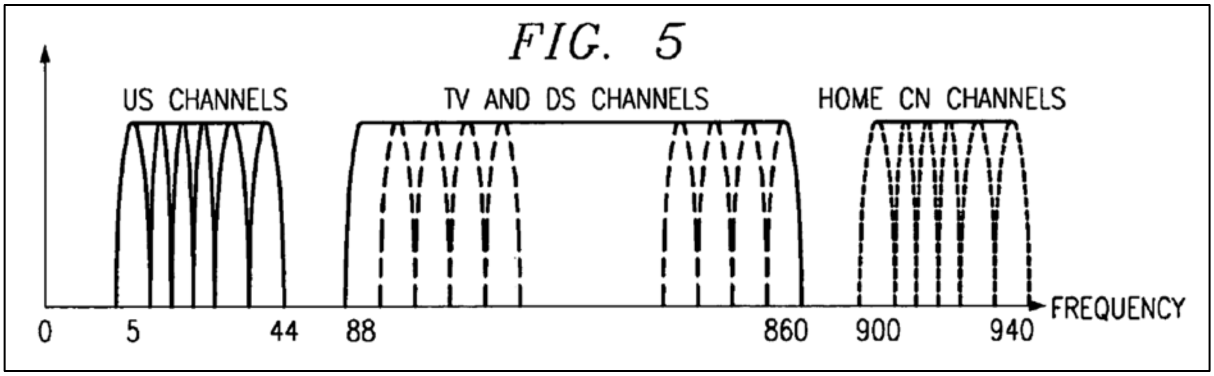
[1.c.ii]

Amit discloses or renders obvious [1.c.ii]. DISH-1003, ¶¶75-78. In Figure 2, each of Amit's terminal devices [204–207, 212] couples to a tap port of splitter [203], and in Figure 7, terminal devices [701-704] couple to a tap port of splitter [706], while terminal devices [703-704] couple to a tap port of splitter [705]. DISH-1005, 6:36-41, Figs. 2, 7.

[1.c.iii]

Amit discloses or renders obvious [1.c.iii]. DISH-1003, ¶¶79-83. The '249 patent explains that "the frequency channels in OFDM may be called

frequency bins." DISH-1001, 8:42-43. Similarly, Amit teaches providing multiple frequency channels/bins for the terminal devices to transmit in. For example, Amit's Figure 5 "presents a frequency allocation that may be employed by the present invention." DISH-1005, 5:28-29. This "typical channel allocation … is suitable for example to a system that supplies TV channels, DOCSIS CM (US and DS), and HomeCN channels." *Id.*, 7:61-65.



Amit, FIG. 5.

Amit's terminal devices provide more transmit bits which occupy parts of the channel in which the signal to noise ratio is high. *Id.*, 8:30-39. Amit teaches that "[t]he modulation method is QPSK, QAM 16, QAM 64 or QAM 256 **according to the channel conditions**." *Id.*, 8:30-32. "The modulator of the home networking device MUST provide QPSK and QAM 16" and "MAY provide QAM 64 and QAM 256." *Id.*, 8:33-36. Likewise, "[t]he modulator MUST provide 2,560 ksym/sec" and "MAY provide 160, 320, 640, 1,280, and 5,120 ksym/sec." *Id.*, 8:37-39. Amit thus explains that the modulation method and number of data-

symbols-per-second vary "according to the channel conditions." *Id.*, 8:30-39. A POSITA would have understood that, where a channel's SNR is high (*i.e.*, good channel conditions), Amit's terminal device would use a higher modulation method (*e.g.*, QAM 64) providing more transmit bits (*i.e.*, higher kysm/sec). DISH-1003, ¶82 (citing DISH-1013-DISH-1014).

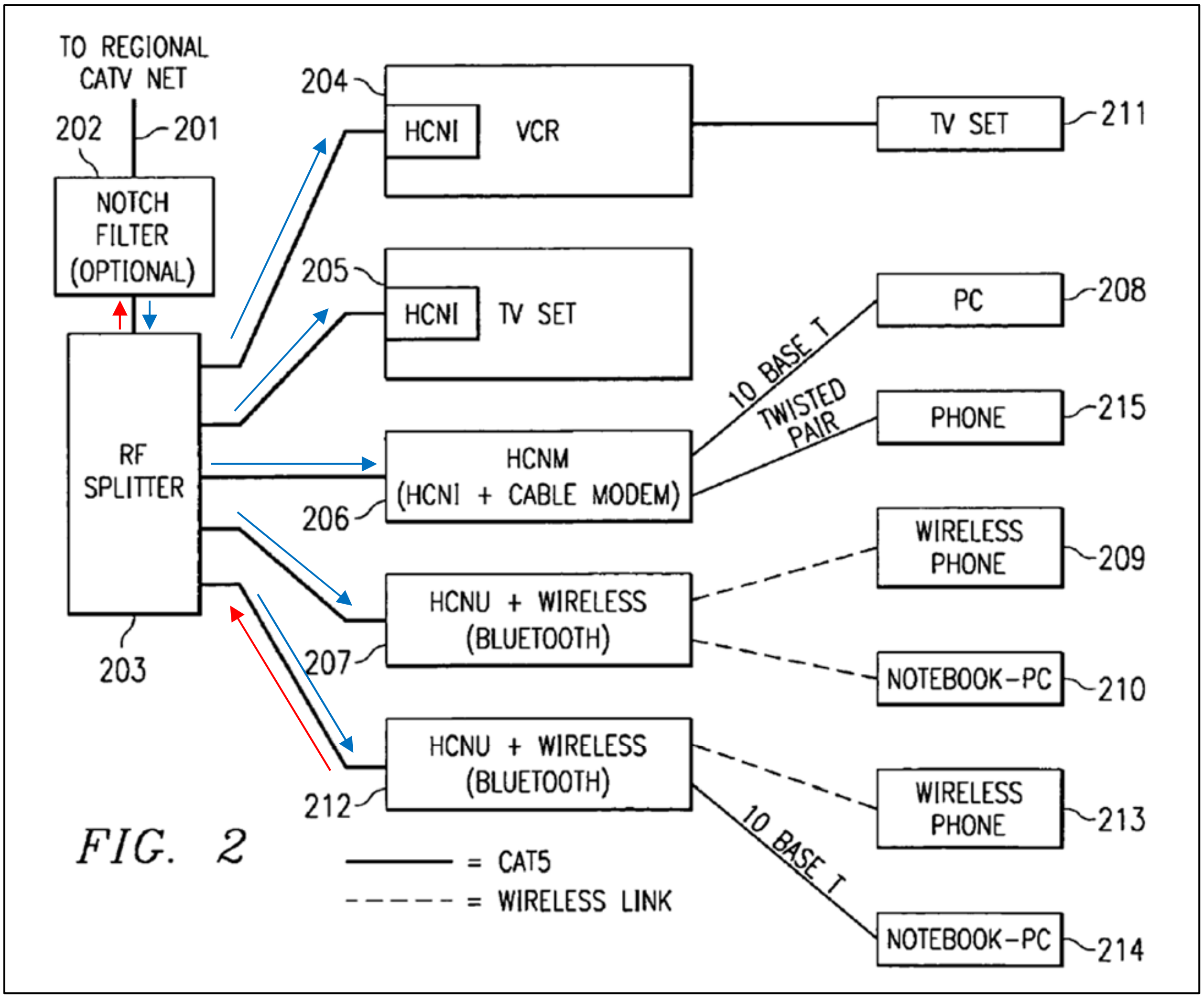
Further, the '249 patent acknowledges it was generally known in the art that frequency bins with lower SNR use lower-order constellations, *e.g.*, QPSK. DISH-1001, 8:22-29. To the extent Patentee asserts Amit does not disclose [1.c.iii], a POSITA would have found it obvious for Amit's terminal devices to provide frequency bins with more transmit bits when using QAM64/QAM256 for signals with high SNR because this would take advantage of the higher-order constellation schemes of QAM64/QAM256, allowing nodes to transmit more data-per-second. DISH-1003, ¶82.

[1.d]

Amit discloses or renders obvious [1.d]. DISH-1003, ¶¶84-91. Amit's first "key principle" is that "devices may communicate **directly** (not via the headend)" because signals "propagate between the devices **via reflections** from other devices in the line." DISH-1005, 3:19-23. Amit teaches of "notch filter reflection" and "[h]igh reflection" from the notch filter. *Id.*, 13:44-14:1. The "reflection from the notch filter is in the power of the signal or it might be higher," and "[w]hen this

reflection is higher than the signal, we can use this reflection as our main signal." *Id.*, 14:1-5.

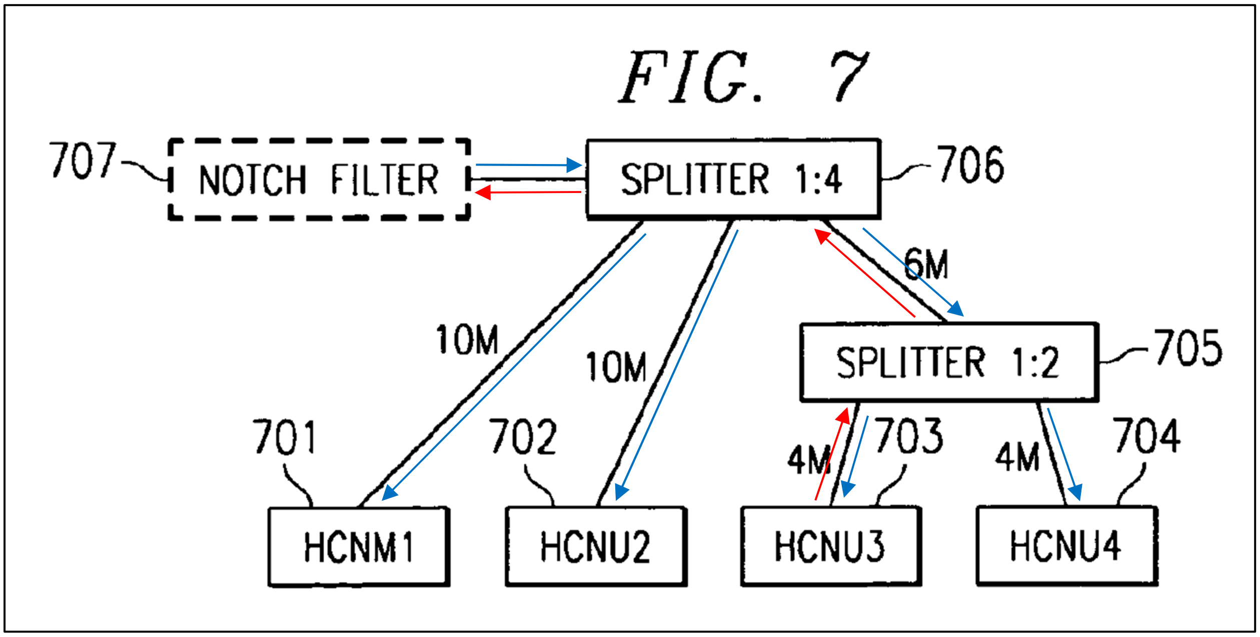
For Figure 2's network, Amit teaches or renders obvious using reflections from the filter as pathways for terminal devices to communicate directly with each other. DISH-1003, ¶86. Amit's "Notch filter [202] ... is a band reject filter that does not pass a certain RF range that is used by the home networking devices [204–207, 212]." DISH-1005, 6:29-31. And when describing high reflections of notch filters, Amit discloses that the filter reflects those RF signals, providing a path back through the tap port of the signal splitter and out each other tap port. *Id.*, 3:19-23, 14:1-5. One such path is shown below, where HCNU [212] transmits signals through splitter [203] that reflect off filter [202] before passing through splitter [203] again and flowing out each other tap port to terminal devices [204]-[207].



Amit, FIG. 2 (Annotated).

Amit's Figure 7 provides another example. Amit explains that "the communication between 703 and 704 might be 'hidden' from 701 in particular when the notch filter [707] does not exist." *Id.*, 13:65-67. But, "for homes that have [a] notch filter," Amit teaches that "Two Modems in the Same Flat" communicate via the "Echo from the notch filter," and calculates the corresponding signal loss in this filter-reflection signal path. *Id.*, 14:10-65.

For this "Echo from the notch filter" path shown below, the signal loss includes two "Insertion Loss[es]" because the signal travels through splitters [705] and [706], a "Return Loss [707]" because of the reflection from filter [707], and two more "Insertion Loss[es]" because the signal travels back through splitters [705] and [706] after the reflection. *Id.*, 14:15-50.



Amit, FIG. 7 (Annotated).

Thus, the reflections from the filter [707] provide a path for terminal devices [703] and [704] to communicate directly with each other to form the signal distribution network, as shown above.[7]

[7] Amit provides two other exemplary notch filter reflection paths: [701]-[702] and [701]-[704]. DISH-1005, 14:15-65.

(b) Claim 2

Amit discloses or renders obvious claim 2. DISH-1003, ¶¶92-96. Amit teaches that "[t]here are some alternatives for channel allocation" for home networks, including "known methods" such as "TDM-Time Domain Multiplexing." DISH-1005, 26:1-45. A POSITA would have understood Amit's network would use TDD for communication channels between terminal devices because TDD is the application of TDM to separate outgoing and incoming signals, which is why it is referred to as time domain **duplex**. DISH-1003, ¶94 (citing DISH-1015-DISH-1016).

Amit further explains that this method "[r]equires synchronization" and that a HCNU is "required to get the sync from the cable modem network." *Id.*, 26:35-45. The '249 Patent acknowledges, via reference of Gibbs, that it was generally known in the art that TD-based protocols use broadcast beacon messages to synchronize nodes. DISH-1001, 2:42-59, 6:35-48; DISH-1003, ¶95 (citing DISH-1017-DISH-1018). Thus, a POSITA would have understood that broadcasting a beacon message on the network is a common way of synchronizing TDM communications and would have understood such a message to be inherent in Amit's network or, separately, would have been motivated include such a message. *Id.*, ¶¶92-96.

B. GROUND 2: Claims 1-17 are Rendered Obvious by Amit and ADSL/VDSL

1. ADSL/VDSL Reference Overview

"ADSL/VDSL Principles: A Practical and Precise Study of Asymmetric Digital Subscriber Lines and Very High Speed Digital Subscriber Lines" is a textbook (hereinafter, "ADSL/VDSL"). DISH-1006, Cover. ADSL/VDSL was publicly available in 1999 and qualifies as prior art under at least 102(b). DISH-1022, ¶¶14-17.

ADSL/VDSL "discusses networks capable of delivering high-speed data to all end users." DISH-1006, 1. The drivers for such high-speed communications include "the Internet and World Wide Web (WWW), video services, consumer services, and entertainment services." *Id.*, 5. ADSL/VDSL also recognizes that "coaxial cable (coax) is available throughout most of the United States" and "can handle high bandwidths." *Id.*, 15.

The '249 patent references ADSL/VDSL as covering "OFDM system architecture," which the patent acknowledges was a known architecture for modulating signals and overcoming multipath effects. DISH-1001, 6:14-17, 7:61-8:11, 8:55-60.

2. Amit-ADSL/VDSL Combination

The Amit-ADSL/VDSL combination incorporates ADSL/VDSL's teachings about implementing OFDM, equalization, forward error correction ("FEC"), and

time division duplex ("TDD") to more efficiently utilize high-speed communications networks into Amit's teachings about coax-based high-speed home networks.

(a) Motivation

As the '249 patent acknowledges, a POSITA seeking to improve broadband local area networks like Amit's would have been familiar with communications textbooks such as ADSL/VDSL—an analogous reference from the same field of endeavor as the '249 patent: broadband networks, including the communications protocols of such networks. DISH-1001, 8:55-60; DISH-1003, ¶102; *see* §IV.A.1 and §IV.B.1. Both references also recognize how LANs facilitate communications between nodes within the same building or residence, and both acknowledge that the Internet, video services, consumer services, and entertainment services are motivators for high-speed network communications. *Id.*

A POSITA reading Amit's teachings about coaxial networks would have been motivated to improve such networks with methods used in other types of networks, such as ADSL and VDSL. DISH-1003, ¶103. Amit addresses the relatedness of its network and VDSL by explaining that, unlike the prior-art coaxial networking solution that "[i]nterferes with VDSL," Amit's network does not interfere. DISH-1005, 28:67. Indeed, Amit recognizes that "[t]here are several home networking solutions that have already been proposed, including networking

over the existing telephone wiring …, networking over the existing power lines, … and solutions that require new wiring, such as … CAT 5 Ethernet wiring." *Id.*, 1:31-37. Based on Amit's discussion, a POSITA would have been motivated to look at teachings about other home networks, including the copper-based networks described in ADSL/VDSL. DISH-1003, ¶103.

Amit and ADSL/VDSL further demonstrate the overlap between coaxial and non-coaxial networks. Amit recognizes that "[h]ome networks will connect between computing devices … and modems (**such as cable modems, DSL modems**, and PSTN modems) that connect the home outside." DISH-1005, 1:18-25; DISH-1003, ¶104. And while ADSL/VDSL primarily focuses on communications over a twisted pair cable, it also recognizes that "[c]able television delivered via coaxial cable (coax) is available throughout most of the United States" and "can handle high bandwidths, and cable modems take advantage of this." DISH-1006, 15. Indeed, Amit describes using the home's cable network to connect to non-cable infrastructures, *e.g.*, "access network (xDSL)." DISH-1005, 2:24-30.

A POSITA would also have been motivated to combine the teachings of Amit and ADSL/VDSL because they both are reasonably pertinent to overcoming problems in network communication channels, including the problems identified by the '249 patent—"port-to-port isolation and providing a suitable signal path for

terminal-to-terminal communication in a coaxial cable wired building." DISH-1003, ¶105; DISH-1001, 3:4-7. For example, Amit recognizes that "coax cable is an excellent communication medium, as it has a high bandwidth and it is shielded to avoid noise," but even when using coax, there can be "houses where there is a problem with reflection." DISH-1005, 2:51-53, 20:42-43. Indeed, Amit teaches that the modulation method will change "according to the channel conditions." *Id.*, 8:30-32. ADSL/VDSL similarly recognizes that "many channels and noise conditions change over the lifetime of operation," and "[a] good example is the change in twisted pair characteristics due to the difference of temperature during the day and night." DISH-1006, 188. Like Amit, ADSL/VDSL describes techniques to provide a suitable path for terminal-to-terminal communication via, *e.g.*, OFDM, equalization, FEC, and TDD. *See id.*, 166-203.

The subsections below provide further examples of the motivation to combine specific teachings of ADSL/VDSL with Amit's coaxial home network.

(i) OFDM (claims 1, 3-7, 14, 16)

A POSITA would have been motivated to improve the bit rate of Amit's networks using ADSL/VDSL's OFDM modulation, which builds upon the FDM and QAM modulation of Amit. DISH-1003, ¶¶106-109.

Amit explains that "[v]arious types of modulation can be used," but the modulation method "should support high bandwidth rate (more th[a]n 10 Mbps)."

DISH-1005, 25:1-7. “The selected modulations that comply with these requirements are QPSK and QAM.” *Id.*, 25:9-10.

ADSL/VDSL explains that DMT, which “is sometimes called orthogonal frequency division multiplexing (OFDM),” “builds on some of the ideas of QAM.” DISH-1006, 166. Similarly, the ’249 patent explains that “[m]ultitone modulation is also called discrete multitone (DMT) and orthogonal frequency division multiplexing (OFDM).” DISH-1001, 7:61-66. ADSL/VDSL teaches that OFDM allows for “more than one constellation encoder,” where “[e]ach encoder receives a set of bits that are encoded using a constellation encoder as described in the previous sections” on QAM modulation. *Id.* Like QAM, the “output values from the constellation encoder are again the amplitudes of cosine and sine waves,” and “each set of waveforms can be independently decoded in the same way that a QAM signal can be decoded.” *Id.*, 166-67.

Amit further teaches that “[t]he Channel Allocation method should be FDM,” and OFDM is a type of FDM. *Id.*, 25:12-15; DISH-1003, ¶107.

A POSITA would have thus been motivated to use ADSL/VDSL’s OFDM teachings with Amit’s terminal devices to improve upon the FDM and QAM modulation and improve the bit rate.

(ii) Equalization (claims 10-13)

A POSITA would have been motivated to increase the capabilities of Amit’s

terminal devices by adding the equalizers of ADSL/VDSL. DISH-1003, ¶¶110-113.

As discussed above, a POSITA would have been motivated to combine the communications systems and modulation methods of Amit and ADSL/VDSL, and a POSITA would have also been motivated to improve Amit's terminal devices to efficiently utilize the limited networking resources. Amit explains that "**frequency resources are limited**," and "[a]n important point is to define this protocol to use **limited 'cable' resources**," including "limited US (up stream) frequencies" and the fact that, when using "higher frequencies," "their distance is limited." DISH-1005, 9:56, 19:32-37. Amit also explains that the "modulation method" is selected "**according to the channel conditions**, and **according to the equipment capabilities**." *Id.*, 8:30-32.

ADSL/VDSL explains that "[m]ost modern communications systems that **operate near theoretical limits employ equalization** in the transmitter, receiver, or both **to optimize or nearly optimize transmission**." DISH-1006, 187. When the equalization "is done digitally by adaptive digital filters," this "provides a very flexible way to **accommodate different types of channels** and **different types of noise environments**." *Id.* Moreover, these equalizers can be updated "as many **channels and noise conditions change** over the lifetime of operation." *Id.*, 188.

A POSITA thus would have been motivated to add the equalizers of

ADSL/VDSL to Amit's terminal devices to help provide a suitable signal path for terminal-to-terminal communication.

(iii) FEC (claim 15)

A POSITA would have been motivated to look to the teachings of ADSL/VDSL for ways to implement the Amit's FEC. DISH-1003, ¶¶114-117.

Amit teaches that its network has FEC that "MUST support R-S (Reed Salomon)." DISH-1005, 8:40-44. ADSL/VDSL provides details on implementing FEC, including that a FEC block "adds redundancy to the data to be transmitted" where "the FEC block might be able to correct bits that the demodulator decodes incorrectly." DISH-1006, 172. ADSL/VDSL also describes using FEC to recover transmitted signals without errors using "Reed-Solomon codes." *Id.*, 181.

A POSITA also would have been motivated to use FEC to efficiently utilize the limited networking resources for the reasons described in the equalization section, and a POSITA would have thus been motivated to increase the capabilities of Amit's terminal devices by implementing the Reed-Solomon FEC functionality of ADSL/VDSL.

(iv) TDD (claims 2, 9, 17)

Like FEC, a POSITA would have been motivated to look to ADSL/VDSL to implement TDD. DISH-1003, ¶¶118-120. Amit discloses that "[t]here are some known methods to allocate channels for each home-network," including "TDM-

Time Domain Multiplexing," which "[r]equires synchronization." DISH-1005, 26:1-45. Similarly, ADSL/VDSL teaches "modulation methods," including "a time-domain duplexing (TDD) category." DISH-1006, 295. ADSL/VDSL provides details on implementing TDD and recognizes that "[t]he most popular TDD approach proposed for VDSL is the synchronous DMT approach," which requires "properly synchronize[d] frames." *Id.*, 296, 301. ADSL/VDSL teaches such synchronization. *Id.*

A POSITA would thus be motivated to increase the capabilities of Amit's terminal devices via, *e.g.*, synchronization, by implementing TDD as taught in ADSL/VDSL.

(b) Reasonable Expectation of Success

A POSITA would have had a reasonable expectation that the Amit-VDSL/ADSL combination would produce a successful outcome. DISH-1003, ¶¶121-125. When improving Amit's network, a POSITA would have had a reasonable expectation of successfully incorporating the techniques of networks that similarly deliver high-speed data, such as those of ADSL/VDSL. *Id.* Moreover, a POSITA would have had a reasonable expectation of success in incorporating aspects of Amit's high-speed networks with the networking features of ADSL/VDSL. *Id.*

Because Amit discloses using QAM (DISH-1005, 8:30-33, 25:1-10), a

POSITA would have found it straightforward to build upon QAM and implement OFDM based on ADSL/VDSL teachings. DISH-1003, ¶122. Likewise, a POSITA would have expected ADSL/VDSL's OFDM modulation to work in Amit's network, which employs QAM. *Id.* Implementing OFDM would have been within a POSITA's skill level because it and similar modulation techniques are taught/used in a variety of engineering, science, and/or math courses that a POSITA would have taken and because QAM and OFDM are both well-known in the art. *Id.*

Likewise, given Amit's discussions of limited networking resources and varying channel conditions (DISH-1005, 8:30-32, 9:56, 19:32-37), the idea of using an equalizer to optimize or nearly optimize transmission and accommodate different types of channels and noise environments would have been straightforward from a POSITA's perspective. DISH-1003, ¶123. A POSITA would also have expected ADSL/VDSL's equalization techniques to work with Amit, which recognizes that varying channel conditions can necessitate techniques to improve communications. *Id.* Moreover, a POSITA would have been able to implement the equalizers of ADSL/VDSL because the use of such equalizers is common in the work of a POSITA and is also part of the engineering courses that a POSITA would have taken. *Id.*

For these same reasons, a POSITA would have had a reasonable likelihood of success in implementing ADSL/VDSL's FEC and TDD communication techniques

into the network of Amit. *Id.*, ¶124. Indeed, Amit refers to these techniques, and a POSITA would look to ADSL/VDSL for additional details on implementing them. *Id.*

The Amit-VDSL/ADSL combination would also have yielded predictable results. *Id.*, ¶125. As described above, OFDM builds on QAM, so implementing OFDM into Amit's system, which already uses QAM, would have yielded predictable results. *Id.* Adding equalization to the terminal devices would have also yielded predictable results consistent with ADSL/VDSL's teachings that "[m]ost modern communications systems that operate near theoretical limits employ equalization in the transmitter, receiver, or both to optimize or nearly optimize transmission." DISH-1006, 187. Finally, implementing FEC and TDD in Amit's system would have yielded predictable results because these techniques are already in Amit. DISH-1003, ¶125.

3. Independent Claims 1, 5, 10

(a) Claim 1

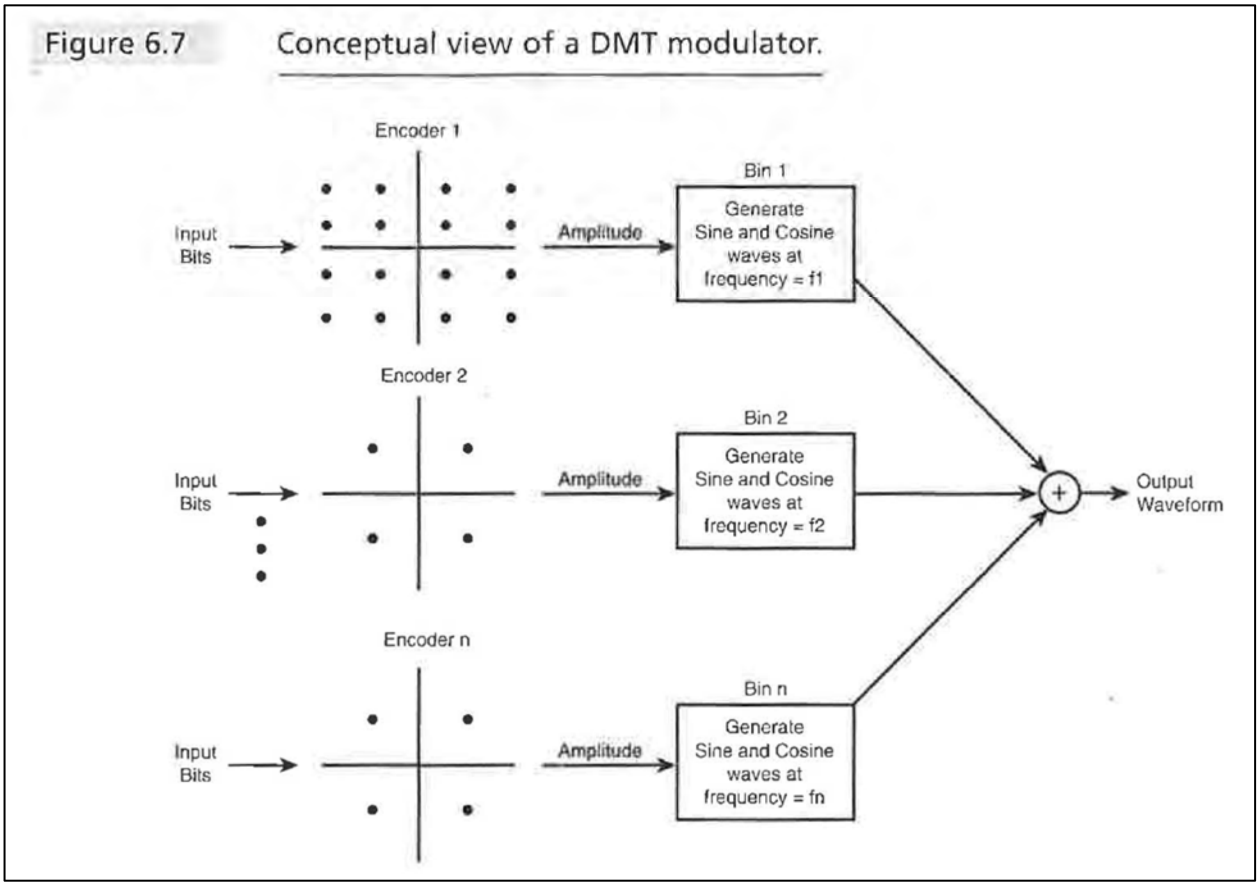
Amit-ADSL/VDSL renders obvious claim 1. DISH-1003, ¶¶126-134. As discussed in Ground 1, Amit renders obvious claim 1, and ADSL/VDSL's teachings further render obvious element [1.c.iii] as explained below.

[1.c.iii]

As shown in Ground 1, Amit discloses or renders obvious elements [1.pre]-

[1.c.ii] and [1.d]. Further, Amit-ADSL/VDSL renders obvious [1.c.iii]. DISH-1003, ¶¶127-133. Specifically, a POSITA would have found it obvious to implement ADSL/VDSL's teachings in Amit's terminal devices [204–207, 212] or [701-704]. *Id.* ADSL/VDSL's "DSL Modulation Basics" chapter "presents some of the basics of modulation systems," including "a discrete multitone (DMT) system" that ADSL/VDSL explains is synonymous with OFDM. DISH-1006, 157, 166.

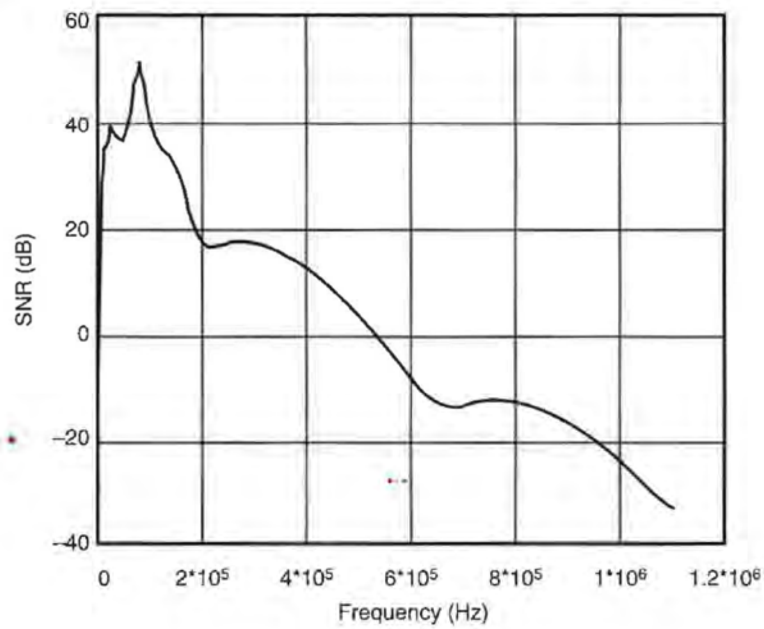
In OFDM/DMT, "[e]ach encoder receives a set of bits that are encoded using a constellation encoder," and "a different sine and cosine frequency is used for each constellation encoder," meaning "the waveforms in each bin are completely separable from one another." *Id.*, 166-67. Below, ADSL/VDSL's Figure 6.7 illustrates this concept of providing frequency bins with different transmit bits.



ADSL/VDSL, FIG. 6.7.

ADSL/VDSL further explains that "DMT allows a communications system to be very flexible and optimally utilize a channel." *Id.*, 171. Figure 6.9 shows the "SNR with respect to frequency of a sample channel," and "DMT bins in the areas where the SNR is high can use more dense QAM constellations." *Id.*

Figure 6.9 SNR with respect to frequency of a sample channel; DMT bins in the areas where the SNR is high can use more dense QAM constellations.



ADSL/VDSL, FIG. 6.9.

ADSL/VDSL explains that, "[c]ompared to the bins when the SNR is low, **the bins occupying parts of the channel where the SNR is high can be used to transmit more bits**." *Id.*, 172. This "process involves increasing the number of points used in the constellations of the 'good' bins." *Id.*; *compare* DISH-1001, 8:23-24 *with* DISH-1006, 172 (having nearly identical disclosures on transmitting more bits in channel bins with high SNR).

(b) Claim 5

Amit-ADSL/VDSL renders obvious claim 5, which is an independent system claim paralleling claim 1 but also reciting coaxial cable building wiring and OFDM

modulation. DISH-1003, ¶¶135-163.

[5.pre]

If the preamble is limiting, Amit-ADSL/VDSL renders obvious [5.pre]. DISH-1003, ¶¶136-138. Amit teaches "home networking solutions that utilize in-home TV wiring for supplying high rate connectivity between any two home networking nodes" via "coaxial (coax) cables." DISH-1005, 2:34-55. Amit further explains that "devices may communicate directly (not via the headend) using RF signaling over the coax cable." *Id.*, 3:19-21. Similarly, ADSL/VDSL's teachings also have utility in coaxial cable LANs. DISH-1006, 5, 15.

[5.a.i]

See [1.c.i], §IV.A.2.(a).

[5.a.ii]

Amit-ADSL/VDSL renders obvious [5.a.ii]. DISH-1003, ¶¶141-146. ADSL/VDSL's "DSL Modulation Basics" chapter "presents some of the basics of modulation systems," including "a discrete multitone (DMT) system," *i.e.*, OFDM. DISH-1006, 157, 166.

ADSL/VDSL further explains how each terminal device communicates with other terminal devices using OFDM. Specifically, the "frequency channels in DMT are [called] frequency bins (or bins), tones or DMT tones, and subchannels," and "the waveforms in each bin are completely separable from one another." *Id.*,

167. As a result, each terminal device in "DMT has a 'receiver' tuned to all of the channels at once," and this allows the terminal devices to communicate using OFDM. *Id.* Thus, and for the reasons detailed in §IV.B.2, a POSITA would have found it obvious for Amit's terminal devices to communicate using OFDM modulation as described in ADSL/VDSL.

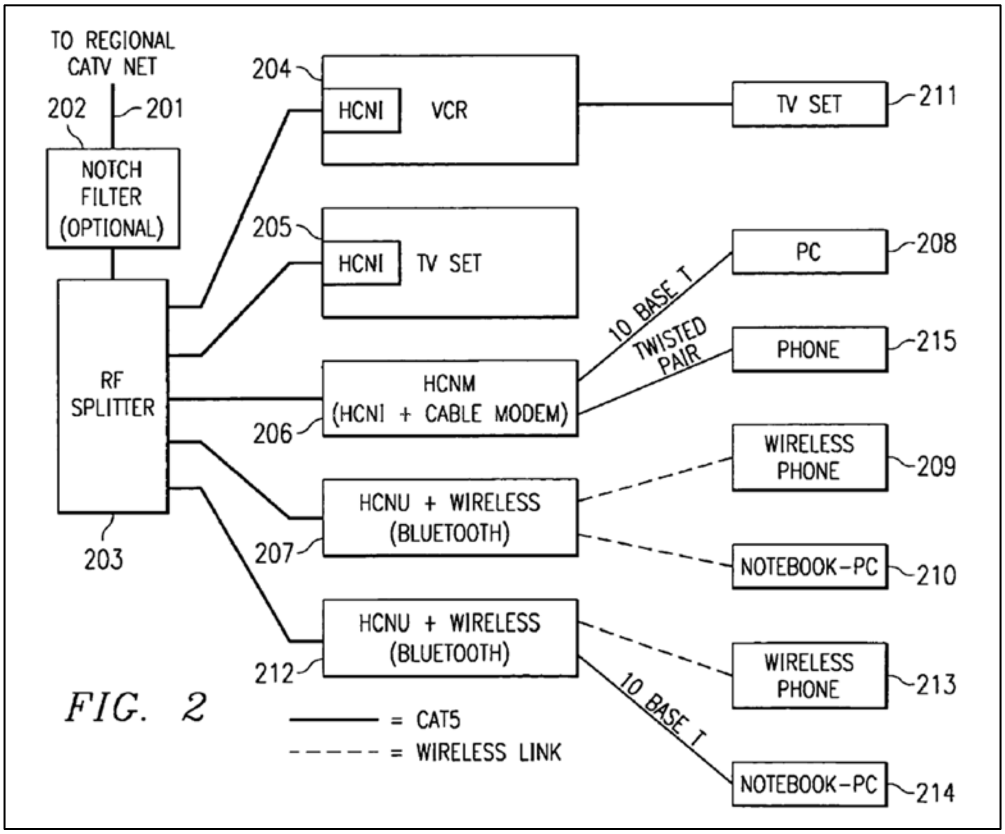
[5.a.iii]

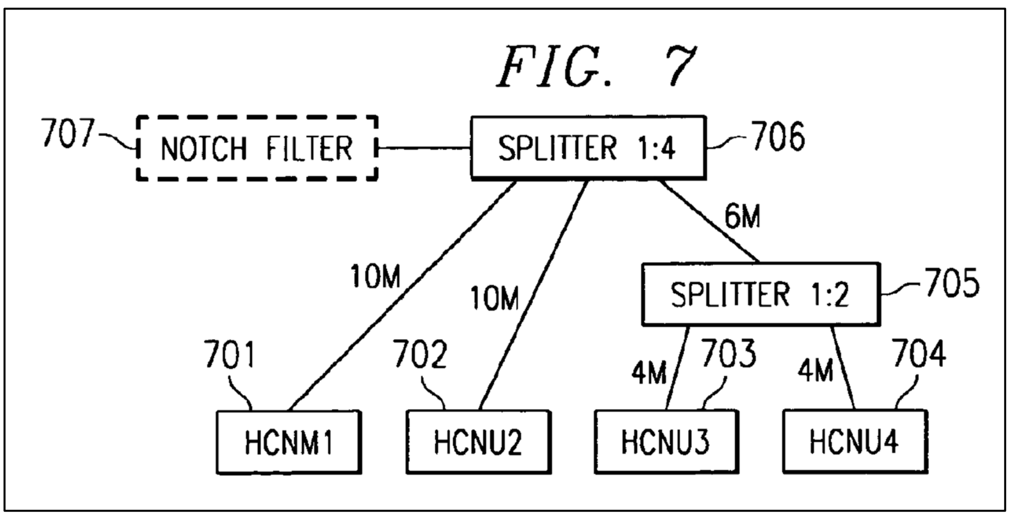
See [1.c.iii], §IV.A.2.(a).

[5.b]

Amit-ADSL/VDSL renders obvious [5.b]. DISH-1003, ¶¶148-152. Amit explains that "TV wiring that consist of coaxial cables are used to connect the antenna/cable TV output, typically via passive splitters, to the cable outlets at specific points in the home," and "[t]he present invention provides home networking solutions that utilize in-home TV wiring for supplying high rate connectivity between any two home networking nodes." DISH-1005, 2:4-6, 2:44-46. Figures 2 and 7 also show a plurality of nodes/"terminal devices" ([204-206], [212], [701-704]) coupled to a network of coaxial[8] building cables.

[8] Amit's file history confirms Figure 2 contains a drafting error—"CAT5" should be "CATV." DISH-1023, STAMP-51.



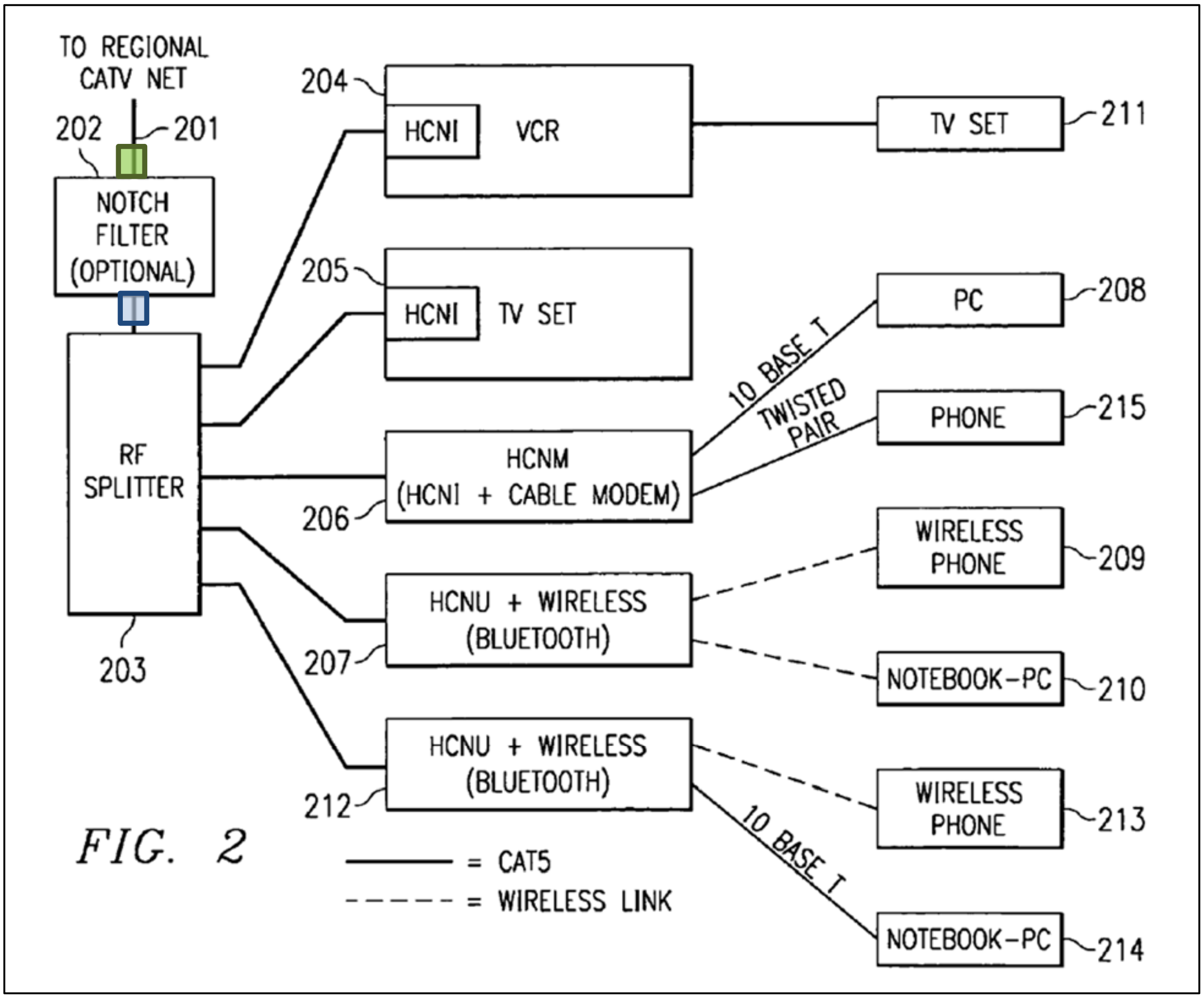


Amit, FIGs. 2, 7.

[5.c.i]

Amit-ADSL/VDSL renders obvious [5.c.i]. DISH-1003, ¶¶153-157. As

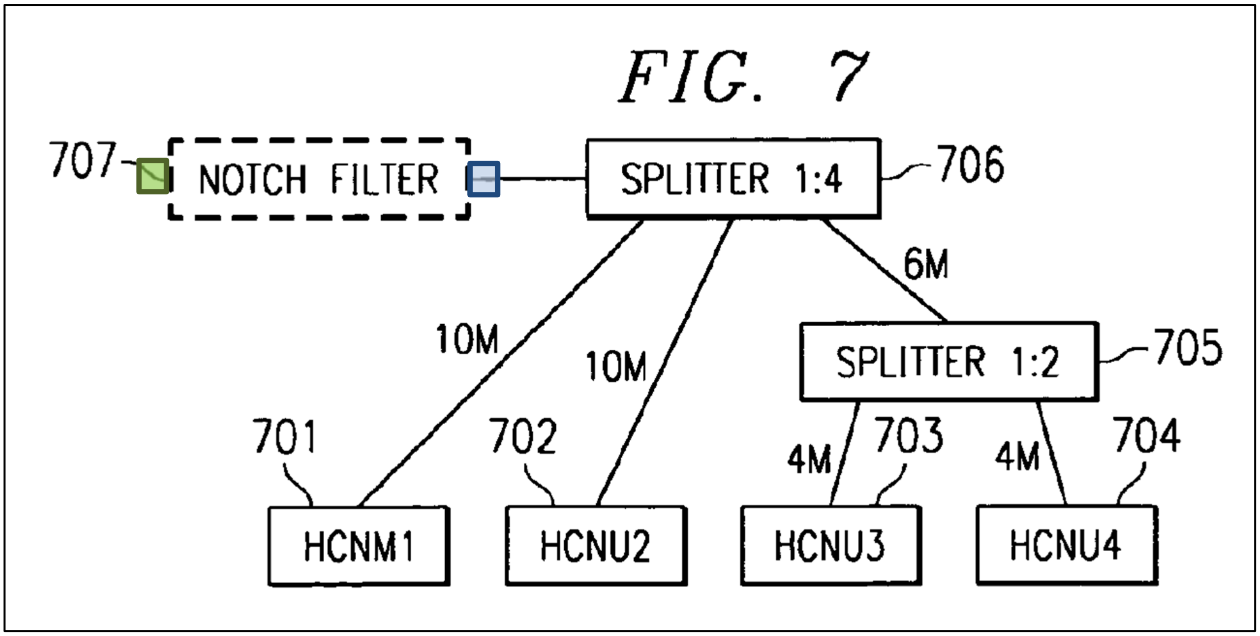
discussed in [1.a], Amit discloses or renders obvious "a filter located at the point of entry of a building," and the filters in Amit's Figures 2 and 7 meet the additional limitations of [5.c.i]. Both figures show filters having first ports (green boxes below) and second ports (blue boxes below). Figure 2 also shows that the first port of notch filter [202] is connected to a building point of entry, as the filter is located at the building point of entry and its first port "is connected to the regional CATV plants via cable [201]." DISH-1005, 6:28; *id.*, 4:30-34. Indeed, Amit's "notch filter should be added … at the flat/single home entrance." *Id.*, 13:31-45. Thus, a POSITA would have understood or found it obvious that Amit's notch filter includes a port connected to the building's point of entry. DISH-1003, ¶¶154-155.



Amit, FIG. 2 (Annotated).

As discussed in [1.b.ii.] and [1.c.ii], Amit discloses or renders obvious the filter being coupled to at least one signal splitter and each terminal device being coupled to a plurality of tap ports of at least one signal splitter. DISH-1003, ¶156. Figures 2 and 7 further show that the terminal devices connect to the second port of the filter via the network of building cables and the splitter. *Id.*, DISH-1005, 2:44-46 ("The present invention provides home networking solutions that utilize in-home

TV wiring for supplying high rate connectivity between any two home networking nodes.”).



Amit, FIG. 7 (Annotated).

[5.c.ii]

Amit-ADSL/VDSL renders obvious [5.c.ii]. DISH-1003, ¶¶158-162.

As discussed in [5.c.i], Amit’s filter has a “second port connected to the plurality of terminal devices via the network of building cables.” As a result, Amit’s “signals transmitted by any of the terminal devices” will be “received at the second port of the filter.”

As discussed in [1.a], Amit discloses or renders obvious “a filter … tuned to reject network signals originating in the building, such that the network signals originating in the building do not pass through the filter, but rather are reflected back

into the building." As a result, Amit's "signals … received at the second port of the filter are rejected by the filter such that such signals do not pass through the filter, but rather are reflected back into the network of building."

As discussed in [1.d], Amit discloses or renders obvious "the reflections from the filter provide a path for terminal devices … to transmit signals to other terminal devices thus allowing terminal devices to communicate directly with each other." As a result, Amit's reflections "create a communication path between the transmitting terminal device and at least one other terminal device coupled to the network of building cables."

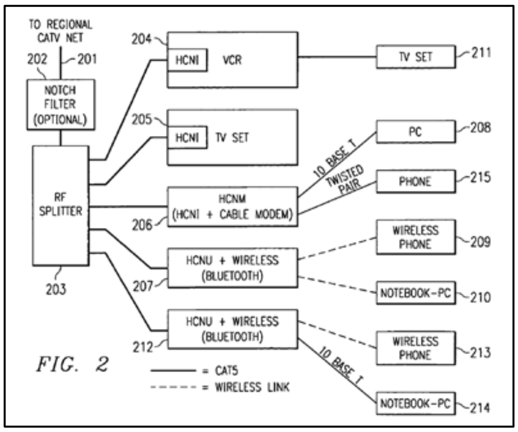
(c) Claim 10

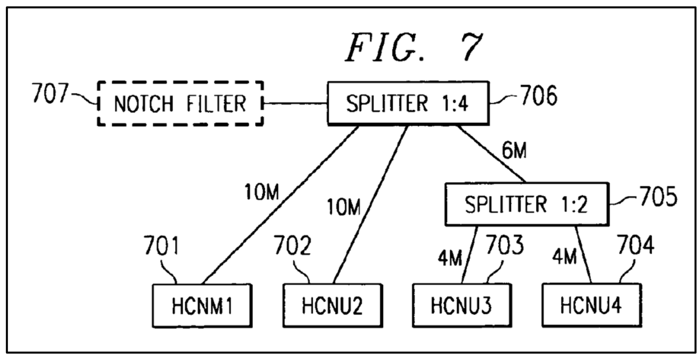
Amit-ADSL/VDSL renders obvious claim 10, which is an independent system claim paralleling claim 1 but adding equalization. DISH-1003, ¶¶164-193.

[10.pre]

If the preamble is limiting, Amit-ADSL/VDSL renders obvious [10.pre]. DISH-1003, ¶¶165-169. As discussed in [5.pre] and [5.a.ii], Amit teaches a broadband LAN using coaxial cable building wiring for transmitting modulating signals. Specifically, Amit teaches transmitting signals using various types of modulation, including "QPSK and QAM." DISH-1005, 2:34-55, 25:1-10. Figures 2 and 7 further demonstrate that Amit's networks use coaxial cable building wiring containing a plurality of branches that connect the terminal devices to the splitters

and notch filter. For example, Figure 7 describes the branches from the splitter [706] to terminal devices [701-702] are each 10 meters long, from the splitter [706] to the splitter [705] is six meters, and from the splitter [705] to terminal devices [703-704] are each 4 meters long. *Id.*, 14:15-65.





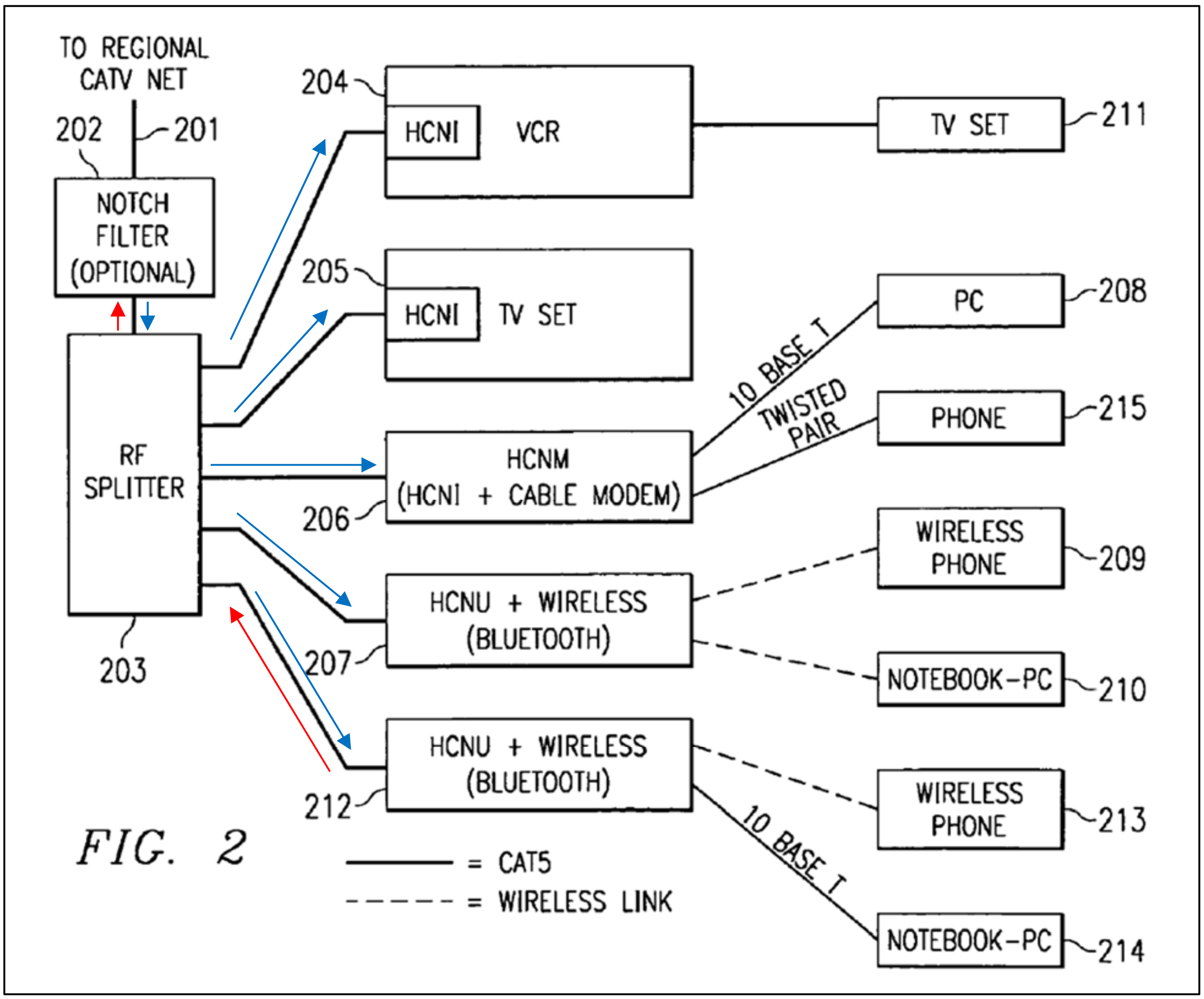
Amit, FIGs. 2, 7.

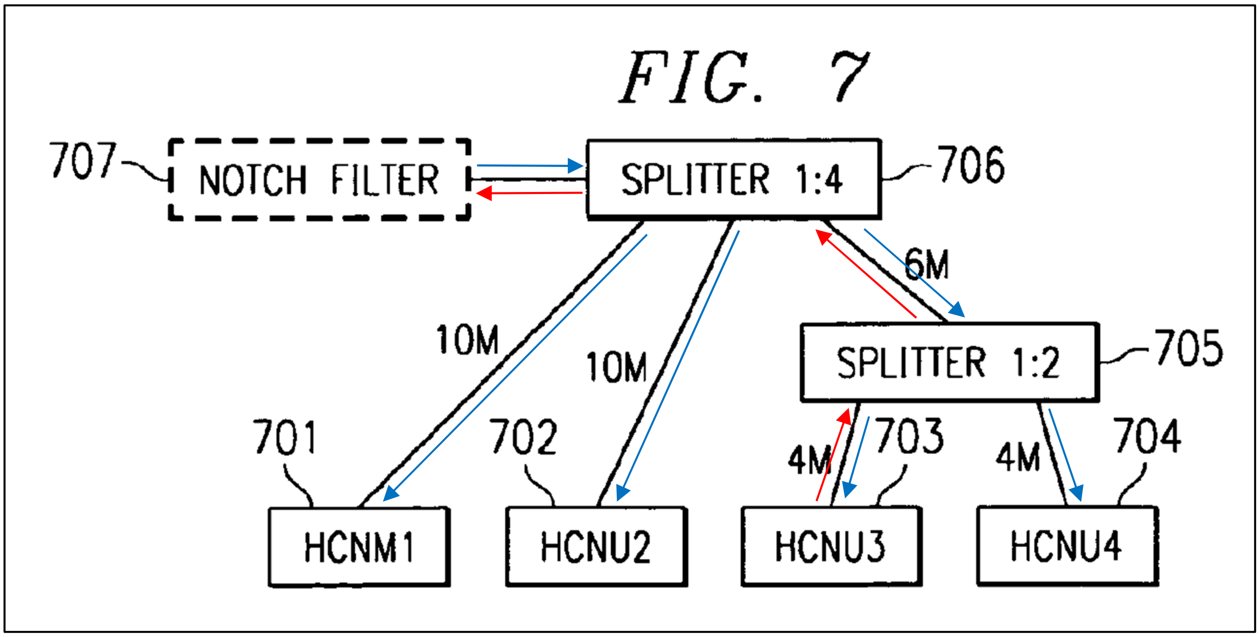
[10.a]

Amit-ADSL/VDSL renders obvious [10.a]. DISH-1003, ¶¶170-174. [10.a] is nearly identical to [1.a], but instead of the filter being "located at the point of entry of a building," it is "located at the point of entry of the building **wiring**," and instead of rejecting "network signals originating in the building, such that the network signals … are reflected back into the building," the filter "rejects network signals originating in the building **wiring** such that the rejected network signals … are reflected … back into **all branches of the building wiring**."

As discussed in [1.a] and [5.c.i], Amit teaches that the filter is located at the

point of entry of the building wiring, which Amit refers to as "the input to the user premises." DISH-1005, 4:30-34. Amit's Figures 2 and 7 demonstrate that its networks use coaxial cable building wiring containing a plurality of branches that connect the terminal devices to the splitters and notch filter. As a result, when the filter reflects "network signals originating in the building … back into the building," those signals are "originating in the building **wiring**" and "reflected … back into **all branches of the building wiring**."





Amit, FIGs. 2, 7 (Annotated).

[10.b]

See [1.b.i], §IV.A.2.(a).

[10.c.i]

Amit-ADSL/VDSL renders obvious [10.c.i]. DISH-1003, ¶¶177-178. This limitation is nearly identical to [1.c] but further recites that the terminal devices are "connected to the wiring branches." Amit's Figures 2 and 7 demonstrate that its network's coaxial cable building wiring contains wiring branches connected to a plurality of terminal devices.

[10.c.ii]

Amit-ADSL/VDSL renders obvious [10.c.ii]. DISH-1003, ¶¶179-181. As discussed in [1.d], Amit discloses or renders obvious that the "the reflections from

the filter provide a path … thus allowing terminal devices to communicate directly with each other." In other words, "each terminal device [is] capable of communicating with other terminal devices [using] the reflected signal path created by the filter," as recited in [10.c.ii].

[10.c.iii]

Amit-ADSL/VDSL renders obvious [10.c.iii]. DISH-1003, ¶¶182-192 (citing DISH-1017, DISH-1019). ADSL/VDSL explains that "[m]ost modern communications systems that operate near theoretical limits employ equalization in the transmitter, receiver, or both to optimize or nearly optimize transmission." DISH-1006, 187. "Often the equalization is done digitally by adaptive digital filters," which "provides a very flexible way to accommodate different types of channels and different types of noise environments." *Id.*

These "adaptive filters converge to optimal initial settings during a training period and then can be updated during normal runtime operation of the system," and such "[u]pdating is necessary as many channels and noise conditions change over the lifetime of operation." *Id.*, 187-88.

ADSL/VDSL further explains how using equalization on the received signal restores a flat frequency response. ADSL/VDSL explains that "[a]ny time a channel's frequency response is **not flat** over the range of frequencies being transmitted, intersymbol interference (ISI) can occur." *Id.*, 188. "The different

types of equalization discussed in" ADSL/VDSL "are mainly intended to remove some or all of this ISI so that optimal decisions can be made on incoming symbols in the receiver." *Id.*, 189. ADSL/VDSL then goes to describe various types of equalization on the received signal that restores a flat frequency response, including time-domain and frequency-domain equalization. *Id.*, 189-203. Thus, and for the reasons detailed in §IV.B.2, a POSITA would have found it obvious for Amit's terminal devices to perform equalization on the received signal that restores a flat frequency response. DISH-1003, ¶¶110-113, 182-192.

Further, Amit-ADSL/VDSL renders obvious that restoring a flat frequency response overcomes communication channel impairments caused by reflected signals. Amit discloses using its network in "houses where there is a problem with reflection," so a "two-frequency mode exists to eliminate the echo problem that exists in some of the homes in the single frequency mode." *Id.*, 20:15-17, 20:42-43. This mode involves "transmitting the information i[n] a specific frequency range (e.g. 900–906 MHz) and receiving the information in a different frequency range (e.g. 910–916 MHz)." *Id.*, 20:17-20. In other words, Amit recognizes how the reflections from the filter can cause frequency selective channel impairments.

ADSL/VDSL similarly recognizes that "many channels and noise conditions change over the lifetime of operation," and "[a] good example is the change in twisted pair characteristics due to the difference of temperature during the day and

night." DISH-1006, 188. Another example is the varying channel and noise conditions caused by the reflected signals. DISH-1003, ¶190. Thus, and for the reasons detailed in §IV.B.2, a POSITA would have found it obvious that restoring a flat frequency response in Amit's signal overcomes communication channel impairments caused by reflected signals. DISH-1003, ¶¶110-113, 182-192.

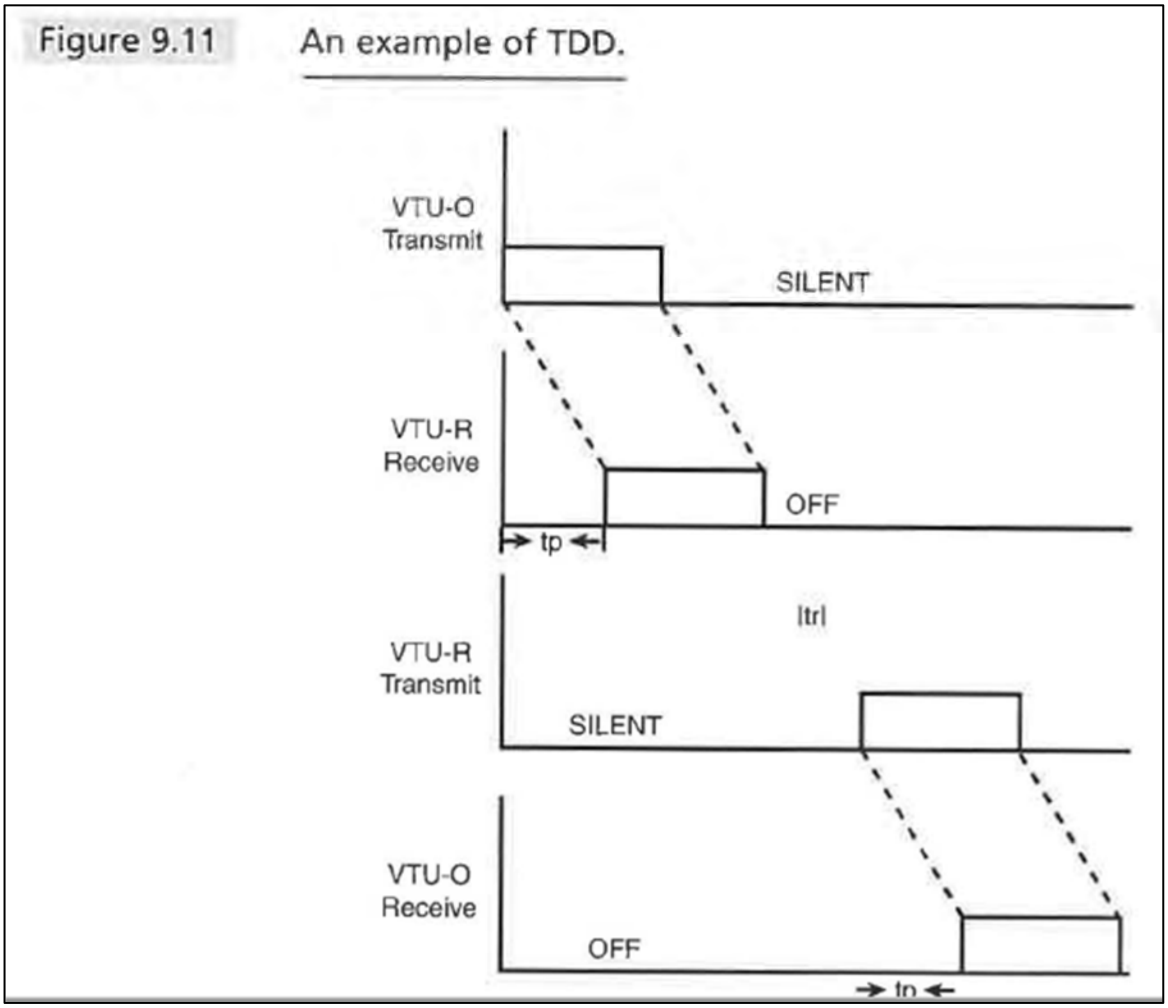
4. Dependent Claims 2-4, 6-9, 11-17

(a) Claim 2, 9, 17

Amit-ADSL/VDSL renders obvious claims 2, 9, and 17, which have no substantive differences. DISH-1003, ¶¶194-199, 222, 246.

As described in §IV.A.2.(b) in Ground 1, Amit alone discloses or renders obvious claim 2.

ADSL/VDSL similarly teaches that "[s]everal different modulation methods have been developed to satisfy the requirements of VDSL," including "a time-domain duplexing (TDD) category and a frequency-domain duplexing (FDD) category." DISH-1006, 295. "TDD is a half-duplex approach for sending signals between two endpoints" where "one modem transmits while its peer modem only receives." *Id.* "After a set amount of time, the process reverses, and the first modem only receives while its peer transmits," and "[t]his basic concept is shown in Figure 9.11." *Id.*



ADSL/VDSL, FIG. 9.11.

ADSL/VDSL also teaches synchronizing communications on the network. ADSL/VDSL recognizes that "[t]he most popular TDD approach proposed for VDSL is the synchronous DMT approach (SDMT)," and "[o]ne issue related to SDMT is the requirement to properly synchronize frames," which "might be feasible by using a common clock." *Id.*, 296, 301.

ADSL/VDSL further teaches broadcasting a beacon message on the network to synchronize communications. ADSL/VDSL explains that "[f]or proper

operation of most systems, the sampling clock at the transmitter and receiver must be exactly the same frequency," meaning "the transmitter and receiver clocks must be locked." *Id.*, 228. "Typically, locking is done by one end being the master clock and the other end recovering the clock." *Id.* ADSL/VDSL further explains the use of a pilot signal as a beacon signal, as "one of the DMT tones is reserved for a pilot signal," and "[t]he pilot tones can be used to resolve sample timing at the receiver." *Id.*, 225. Thus, and for the reasons detailed in §IV.B.2, a POSITA would have found it obvious for Amit's network to use a TDD communications protocol synchronized by a beacon message, and a POSITA would have been motivated to do so to efficiently utilize the limited resources in networks like Amit's and to increase the capabilities of Amit's terminal devices. DISH-1003 ¶¶92-96, 118-120, 194-199.

(b) Claims 3, 7

Amit-ADSL/VDSL renders obvious claims 3 and 7. DISH-1003, ¶¶200-206, 217. As discussed in [5.a.ii], Amit-ADSL/VDSL renders obvious that each terminal device communicates with other terminal devices using OFDM modulation.

ADSL/VDSL further teaches that "a simple method to increase or decrease the output PSD [(Power Spectral Density)] of a transmitter in selected frequency regions. The process involves scaling the complex valued vector **for the bin**

where power adjustment is desired before performing the IFFT. Such adjustment can **boost power** in regions **where the channel insertion loss is poor**, **or reduce power** in regions where interference with other systems must be avoided." DISH-1006, 172; *compare* DISH-1001, 8:23-24 *with* DISH-1006, 172 (having nearly identical disclosures on adjusting power level of OFDM carriers).

As discussed in [10.c.iii], Amit recognizes how the reflections from the filter can cause frequency selective channel impairments, and ADSL/VDSL similarly renders obvious that communication systems must "accommodate different types of channels and different types of noise environments," both of which "change over the lifetime of operation." DISH-1006, 187-88. As described above, Amit-ADSL/VDSL render obvious how to overcome these impairments by adjusting the power level of each OFDM carrier[9] according to the signal loss at each OFDM carrier frequency.

(c) Claims 4, 6

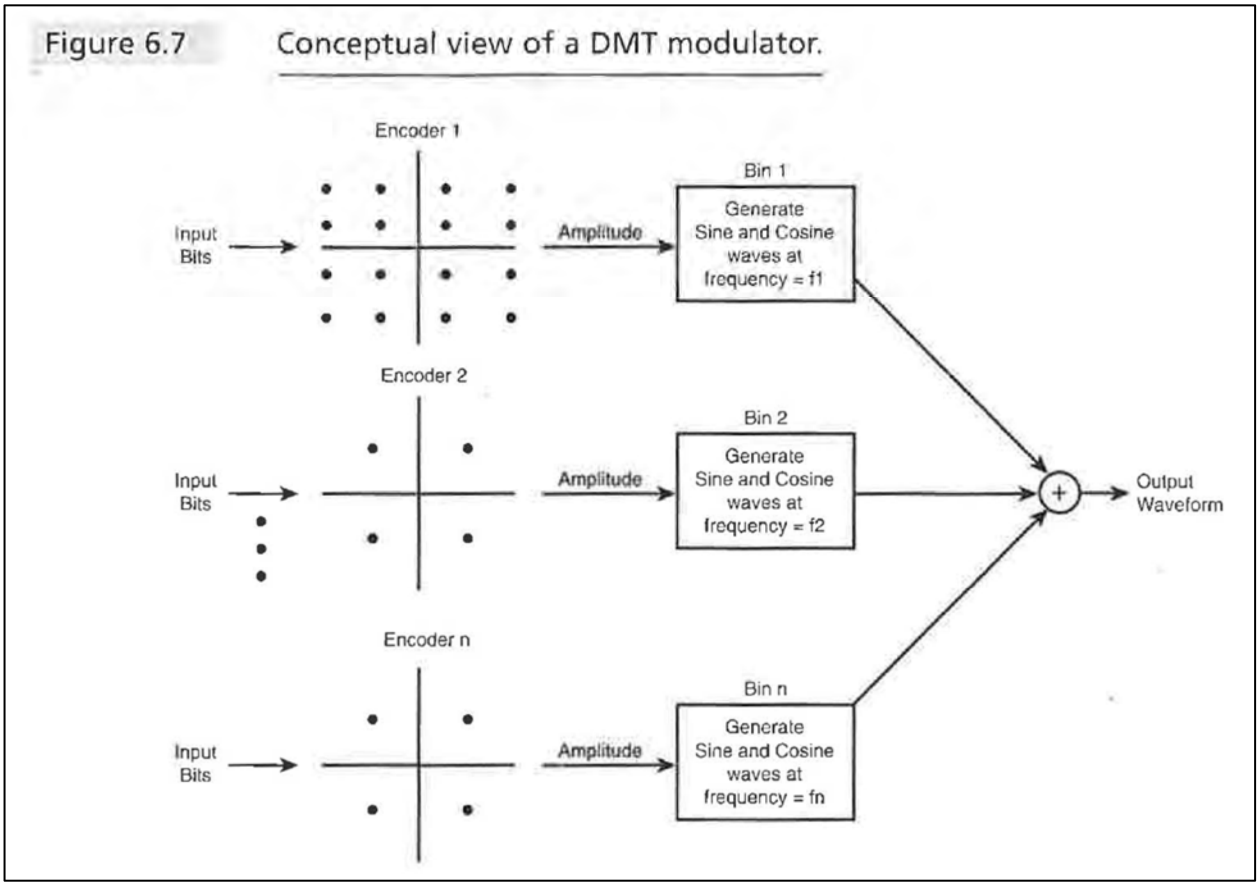
Amit-ADSL/VDSL renders obvious claims 4 and 6. DISH-1003, ¶¶207-216. As discussed in [5.a.ii], Amit-ADSL/VDSL renders obvious that each terminal device communicates with other terminal devices using OFDM modulation.

[9] The '249 Patent recognizes that OFDM carriers are sometimes called bins. DISH-1001, 8:42-43.

ADSL/VDSL further teaches that the modulation order of each OFDM carrier is adjusted according to the signal to noise ratio (SNR) at each OFDM carrier frequency.

The ’249 patent explains that “[e]ach carrier may be modulated with a different order constellation, where higher SNR frequencies can bear a higher order constellation, and the resulting closer spacing of the constellation points. Frequencies with the lower SNR use lower order constellations such as QPSK.” DISH-1001, 8:24-29.

ADSL/VDSL explains how “[e]ach encoder receives a set of bits that are encoded using a constellation encoder,” as shown in Figure 6.7. DISH-1006, 166-67.



ADSL/VDSL, FIG. 6.7.

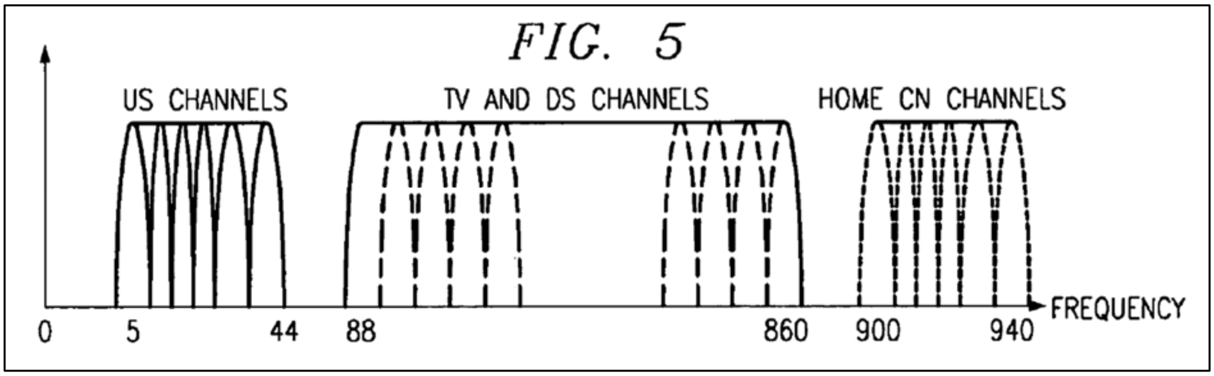
As shown in [1.c.iii], ADSL/VDSL teaches how OFDM provides flexibility and channel utilization optimality in networks like Amit's using, for example, more bins when SNR is high to transmit more bits. *Id.*, 171-172, Fig. 6.9 (illustrating use of "more dense QAM constellations" in OFDM binds with higher SNR); DISH-1001, 8:32-35 (using nearly identical disclosure as ADSL/VDSL). Amit similarly explains that "[t]he modulation method is QPSK, QAM 16, QAM 64 or QAM 256 **according to the channel conditions**." DISH-1005, 8:30-32.

As discussed in [10.c.iii], Amit recognizes how the reflections from the filter

can cause frequency selective channel impairments, and as described above, Amit and ADSL/VDSL both disclose how to overcome channel impairments by adjusting the modulation order of each OFDM carrier. Thus, and for the reasons detailed in §IV.B.2, a POSITA would have found it obvious for Amit's terminal devices to use OFDM and adjust the modulation order as claims 4 and 6 require.

(d) Claim 8

Amit-ADSL/VDSL renders obvious claim 8. DISH-1003, ¶¶218-221. The '249 patent explains that "the standard cable use frequencies [] extend to 550 MHz or 750 MHz." DISH-1001, 5:28-30. And Amit teaches that "[w]hen the home coaxial cables are connected to a local or regional CATV network, the HomeCN is done in an out-of-band frequency (i.e. band that is not in use, e.g. **above 860 MHz**)." DISH-1005, 3:24-30. This is further shown by Figure 5, which "presents a frequency allocation that may be employed by the present invention" where the HomeCN channels used from communicating are above the TV channels. *Id.*, 5:28-29.



Amit, FIG. 5.

(e) Claim 11

Amit-ADSL/VDSL renders obvious claim 11. DISH-1003, ¶¶223-226. ADSL/VDSL explains that "[e]qualization can be done in the frequency domain instead of in the time domain." DISH-1006, 201. ADSL/VDSL explains that "a modulation technique such as DMT [*i.e.*, OFDM] … may lend itself nicely to frequency-domain equalization." *Id.*, 201; 166.

(f) Claim 12

Amit-ADSL/VDSL renders obvious claim 12. DISH-1003, ¶¶227-230. As discussed in claim 11, ADSL/VDSL recognizes using frequency domain equalization as an alternative to time domain equalization. DISH-1006, 201. ADSL/VDSL further explains that, "if the impulse response of the channel is larger than the length of added cyclic prefix, … the channel will no longer look circular." *Id.*, 202. "The solution is to combine some front-end **time-domain equalization**," which can "restor[e] the circular property desired." *Id.*, 203. Thus, for channels

with larger impulse responses, a POSITA would have found it obvious for Amit's equalization to be time domain equalization.

(g) Claim 13

Amit-ADSL/VDSL renders obvious claim 13. DISH-1003, ¶¶231-234. As discussed in [10.c.iii], ADSL/VDSL explains that "[o]ften the equalization is done digitally by **adaptive** digital filters," which "provides a very flexible way to accommodate different types of channels and different types of noise environments." DISH-1006, 187. Thus, and for the reasons detailed in §IV.B.2, a POSITA would have found it obvious for Amit's equalization to be adaptive to provide a flexible way to accommodate different types of channels and noise environments.

(h) Claims 14, 16

Amit-ADSL/VDSL renders obvious claims 14 and 16. DISH-1003, ¶¶235-238, 245. As discussed in [5.a.ii], Amit-ADSL/VDSL renders obvious that the terminal devices use OFDM modulation.

As discussed in claims 3-4, Amit-ADSL/VDSL further teaches using OFDM modulation "to overcome frequency the communication channel impairments caused by the reflected signals."

(i) Claim 15

Amit-ADSL/VDSL renders obvious claim 15. DISH-1003, ¶¶239-244.

The ’249 patent, Amit, and ADSL/VDSL each teach of using FEC, including Reed-Solomon. DISH-1001, 8:44-47; DISH-1005, 8:40-44; DISH-1006, 172.

ADSL/VDSL also describes how FEC is used to recover the transmitted signals without errors. *Id.*, 173-74, 181.

C. GROUND 3: Claims 1-2, 4-6, 8-10, 12-14, 16-17 are Rendered Obvious by Amit and Jacobsen

1. Jacobsen Overview

Jacobsen is an IEEE article titled “An Efficient Digital Modulation Scheme for Multimedia Transmission on the Cable Television Network.” DISH-1007, 305. Jacobsen was publicly available in 1994 and qualifies as prior art under at least 102(b). DISH-1022, ¶¶10-13.

Jacobsen “present[s] a comparison between the performances of single-carrier modulation with equalization and multicarrier modulation on simulated cable television (CATV) channels.” DISH-1007, 305. Jacobsen explores “[t]he feasibility of offering high-speed interactive data services to customers on CATV networks or similar broadband coaxial networks.” *Id.* In doing so, Jacobsen seeks to overcome “several electrical transmission problems” relating to “CATV networks.” *Id.* Jacobsen recognizes that the “hardware in CATV networks is not ideal” as the “[t]aps, amplifiers, and splitters can all cause signals to be reflected at

their insertion points." *Id.*

Due to "[v]ariations in a channel's frequency response cause successively transmitted symbols to interfere with one another, an effect known as intersymbol interference (ISI)," Jacobsen teaches techniques for combatting ISI in CATV networks. *Id.*

2. Amit-Jacobsen Combination

The Amit-Jacobsen combination modifies Amit's coaxial home network by incorporating Jacobsen's techniques for multimedia transmission on CATV networks, including modulation and equalization.

(a) Motivation

A POSITA seeking to implement Amit's coaxial home network would have looked to references that address broadband coaxial networks, including Jacobsen, which is in the same field of endeavor as the '249 patent: broadband coaxial networks and the techniques for communicating in such networks. DISH-1003, ¶¶253-270; *see* §IV.A.1, §IV.C.1. Both references also recognize how high-speed interactive data services drive the implementation of broadband coaxial networks. *Id.*

A POSITA reading Amit's teachings about coaxial networks would have been motivated to improve such networks using techniques from analogous coaxial networking publications like Jacobsen. DISH-1003, ¶253.

A POSITA would also have been motivated to combine the teachings of Amit and Jacobsen because they are both reasonably pertinent to solving the problems identified by the '249 patent (*i.e.*, "port-to-port isolation and providing a suitable signal path for terminal-to-terminal communication in a coaxial cable wired building") and do so by utilizing the reflections present in coaxial networks and overcoming the resulting communication channel impairments. DISH-1001, 3:4-7. For example, Amit recognizes that "coax cable is an excellent communication medium," but there can be "houses where there is a problem with reflection." DISH-1005, 2:51-53, 20:42-43. Moreover, variations in "channel conditions" necessitate Amit's communication techniques (*e.g.*, QAM). *Id.*, 8:30-32.

Jacobsen similarly recognizes that "[t]aps, amplifiers, and splitters can all cause signals to be reflected at their insertion points," and the corresponding "[v]ariations in a channel's frequency response cause successively transmitted symbols to interfere with one another, an effect known as intersymbol interference (ISI)." DISH-1007, 305. Moreover, "[a] second source of signal degradation in CATV networks is interference from other signals." *Id.*, 306. Like Amit, Jacobsen describes techniques for providing a suitable path for terminal-to-terminal communication —*e.g.*, single-carrier QAM with equalization and multicarrier modulation. *See id.*, 305-06.

(i) Modulation (claims 1, 3-7, 14, 16)

A POSITA would have been motivated to improve the bit rate of Amit's network using Jacobsen's teachings that build upon Amit's QAM modulation. DISH-1003, ¶¶256-260.

Amit explains that "[v]arious types of modulation can be used," but the modulation method "should support high bandwidth rate (more th[a]n 10 Mbps)." DISH-1005, 25:1-7. "The selected modulations that comply with these requirements are QPSK and QAM." *Id.*, 25:9-10.

Jacobsen teaches a "candidate technique[] for multimedia transmission on the CATV network: single-carrier quadrature amplitude modulation (QAM) with equalization and multicarrier modulation." DISH-1007, 306. Jacobsen explains that, in multicarrier modulation, "a channel is divided into N equal-bandwidth subchannels" where "[e]ach subchannel then supports its own QAM constellation." *Id.*, 306-07.

Starting with Amit's terminal devices that use QAM modulation, a POSITA would have been motivated to apply Jacobsen's teachings to arrive at single carrier QAM modulation with equalization or multicarrier modulation that each builds upon QAM by allowing for several subchannels having their own QAM constellation. Indeed, Amit recognizes that "signals will typically propagate between the devices via reflections from other devices in the line" (DISH-1005,

3:19-23) and that there can be "houses where there is a problem with reflection" (*id.*, 20:42-43). When implementing modulation in Amit's network, a POSITA would have been motivated to look to Jacobsen's teachings of how to compensate for "[v]ariations in a channel's frequency response," which are caused by the signal reflections and result in ISI. DISH-1007, 305.

A POSITA would have thus been motivated to use Jacobsen's modulation teachings with Amit's terminal devices to improve the QAM modulation and the bit rate.

(ii) Equalization (claims 10-13)

A POSITA would have been motivated to increase the capabilities of Amit's terminal devices by adding Jacobsen's equalizers. DISH-1003, ¶¶261-265.

As discussed above, a POSITA would have been motivated to combine the coaxial broadband networks and modulation methods of Amit and Jacobsen, and a POSITA would have also been motivated to efficiently utilize Amit's networking resources. Amit explains that "**frequency resources are limited**," and "[a]n important point is to define this protocol to use **limited 'cable' resources**," including "limited US (up stream) frequencies" and the fact that, when using "higher frequencies," "their distance is limited"—meaning a higher frequency signal cannot travel as far. DISH-1005, 9:56, 19:32-37. Amit also explains that the "modulation method" is selected "**according to the channel conditions**, and

according to the equipment capabilities." *Id.*, 8:30-32.

Jacobsen teaches how to utilize limited frequency resources with the assistance of equalizers. For example, Jacobsen recognizes that CATV networks will "demand high spectral efficiency in those channels allocated for the new services." DISH-1007, 305. To help satisfy this demand, Jacobsen teaches that "CATV networks can also have high-frequency attenuation reduced by the installation of **equalizing diplex amplifiers** that can boost the usable spectrum to 1 GHz." *Id.*

Jacobsen also teaches using equalizers to improve communications despite sub-ideal channel conditions. Jacobsen recognizes that "[t]aps, amplifiers, and splitters can all cause signals to be reflected," which can cause "intersymbol interference (ISI)." DISH-1007, 305. Jacobsen explains that given "the desire to achieve high throughput with little latency," one of "two practical options" is "single-carrier quadrature amplitude modulation (QAM) with equalization." *See id.*, 306. "Because practical channels cause ISI, **an equalizer is used to reduce the ISI**, thereby improving the performance of the system with a fixed complexity." *Id.*

A POSITA thus would have been motivated to add Jacobsen's equalizers to Amit's terminal devices to help provide a suitable signal path for terminal-to-terminal communication.

(b) Reasonable Expectation of Success

A POSITA would have had a reasonable expectation that the Amit-Jacobsen combination would produce a successful outcome for similar reasons to those discussed above for the combination in Ground 2 and for the reasons explained in Dr. Acton's declaration. DISH-1003, ¶¶266-270 (citing DISH-1020-DISH-a1021).

3. Independent Claims 1, 5, 10

(a) Claims 1, 5

Amit-Jacobsen renders obvious claims 1 and 5. DISH-1003, ¶¶271-285. As discussed in §IV.A.2.(a), Amit discloses or renders obvious every element of claim 1. And as discussed in §IV.B.3.(b), Amit discloses or renders obvious elements [5.pre]-[5.a.i] and [5.b]-[5.c.ii]. As explained below, Jacobsen's teachings further render obvious the identical elements [1.c.iiii] and [5.a.iii].

[1.c.iii], [5.a.iii]

Amit-Jacobsen renders obvious [1.c.iii] and [5.a.iii]. DISH-1003, ¶¶272-276, 284-285. As discussed below, a POSITA would have found it obvious to use Jacobsen's teachings in Amit's terminal devices [204–207, 212] and [701-704].

The '249 patent explains that "the frequency channels in OFDM may be called frequency bins." DISH-1001, 8:42-43. Jacobsen similarly explains that, "[i]n multicarrier modulation, a channel is divided into N equal-bandwidth subchannels, each with its own carrier." DISH-1007, 306.

Jacobsen teaches that, "[i]n contrast to traditional frequency-division multiplexing (FDM) techniques, multicarrier modulation does not constrain the number of bits per subchannel to be equal for all subchannels." *Id.*, 306-07. "Instead, **bits are originally assigned to subchannels** just after training during system initialization **in direct proportion to the subchannel signal-to-noise ratios**." *Id.*, 307. "As a result, **subchannels that suffer from little attenuation and/or little noise carry the most bits**, while subchannels that are severely attenuated and/or very noisy might not carry any bits." *Id.* Thus, it would have been obvious for Amit's terminal devices to provide frequency bins with more transmit bits occupying parts of the channel with high SNR.

[5.a.ii]

Amit-Jacobsen renders obvious [5.a.ii]. DISH-1003, ¶¶278-283.

Jacobsen "discuss[es] two candidate techniques for multimedia transmission on the CATV network," including "multicarrier modulation." DISH-1007, 306. Jacobsen explains that "[i]n multicarrier modulation, a channel is divided into N equal-bandwidth subchannels, each with its own carrier, such that the frequency response is roughly constant across each subchannel." *Id.* Like the '249 patent, which shows DMT and OFDM are synonymous, Jacobsen recognizes DMT is "a common form of multicarrier modulation" that "makes the subchannels exactly independent and memoryless in the white Gaussian noise case by using the basis

vectors of the inverse fast Fourier transform (IFFT) as the subchannel carriers and adding a cyclic prefix to each symbol." *Id.*; DISH-1001, 7:61-66. And "[i]n contrast to **traditional** frequency-division multiplexing (FDM) techniques, multicarrier modulation [(*i.e.*, **orthogonal** frequency-division multiplexing)] does not constrain the number of bits per subchannel to be equal for all subchannels." DISH-1007, 306-07. Thus, it would have been obvious for Amit's terminal devices to communicate with other terminal devices using OFDM modulation.

(b) Claim 10

Amit-Jacobsen renders obvious claim 10. DISH-1003, ¶¶286-296. As discussed in §IV.B.3.(c), Amit discloses or renders obvious [10.pre]-[10.c.ii], and Amit-Jacobsen renders obvious [10.c.iii] for the reasons explained below.

[10.c.iii]

Amit-Jacobsen renders obvious [10.c.iii]. DISH-1003, ¶¶287-296. Jacobsen recognizes that "[s]ome CATV networks can also have high-frequency attenuation reduced by the installation of **equalizing** diplex amplifiers that can boost the usable spectrum to 1 GHz." DISH-1007, 305. And Jacobsen teaches a "technique[] for multimedia transmission on the CATV network: single-carrier quadrature amplitude modulation (QAM) with **equalization** and multicarrier modulation." *Id.*, 306. In single-carrier QAM, "[b]ecause practical channels cause ISI, **an equalizer is used to reduce the ISI, thereby improving the performance**

of the system with a fixed complexity." *Id.*

Regarding multicarrier modulation, Jacobsen teaches "the complexity of DMT systems is proportional to the FFT/IFFT size used in the implementation (or, equivalently, the number of sub channels into which the channel is divided)." *Id.*, 308. So Jacobsen teaches "var[ying] the FFT size to determine the effect of a reduced number of subchannels on the achievable bit rate." *Id*. Further, Jacobsen describes using "the smaller FFT sizes (for example, 2N ≤ 256) by implementing a **time-domain equalizer (TEQ)**, the purpose of which is to reduce the required length of the cyclic prefix in exchange for an increase in system complexity." *Id.*, 309. In other words, Jacobsen teaches using equalization in multicarrier modulation—not just single-carrier QAM.

Amit-Jacobsen also renders obvious utilizing equalization to overcome frequency selective communication channel impairments caused by the reflected signals.

As described regarding [10.c.iii] in §IV.B.3.(c), Amit recognizes how the reflections from the filter can cause frequency selective channel impairments.

Jacobsen similarly recognizes "the effects of various distortions on a CATV network, including microreflections." DISH-1007, 305. Jacobsen elaborates by explaining that "[t]he transmission of digital signals over the CATV network is complicated" because "[t]aps, amplifiers, and splitters can all cause **signals to be**

reflected at their insertion points." *Id.* "In particular, splitters in subscriber homes are known to have poor isolation characteristics," and "[t]he **effect of reflected signals on the frequency transfer characteristic** of a CATV channel is passband ripple." *Id.*

Jacobsen teaches that "[v]ariations in a channel's frequency response cause successively transmitted symbols to interfere with one another, an effect known as intersymbol interference (ISI)." *Id.* "Without some scheme to combat ISI, a receiver would make detection errors." *Id.* "Consequently, a robust digital transmission technique for multimedia signals must alleviate the ISI caused by CATV channels if reliable transmission is to be achieved." *Id.*, 306.

As described above, Jacobsen teaches one such technique—equalization is used to overcome channel impairments, such as ISI, and restore a flat frequency response by counteracting the ripple described by Jacobsen.

4. Dependent Claims 2, 4, 6, 8-9, 12-14, 16-17

(a) Claims 2, 9, 17

Amit-Jacobsen renders obvious claims 2, 9, and 17. DISH-1003, ¶¶297-300. As discussed in Ground 1, Amit teaches or renders obvious a TDD protocol for communication in a channel, and the '249 patent acknowledges that it was known that TD-based protocols use broadcast beacon messages to synchronize nodes. DISH-1001, 2:42-59, 6:35-48.

(b) Claims 4, 6

Amit-Jacobsen renders obvious claims 4 and 6. DISH-1003, ¶¶301-308. As discussed in [5.a.ii], Amit-Jacobsen renders obvious that each terminal device communicates with other terminal devices using OFDM modulation.

Jacobsen further teaches that the modulation order of each OFDM carrier is adjusted according to the signal to noise ratio (SNR) at each OFDM carrier frequency.

The ’249 patent explains that “[e]ach carrier may be modulated with a different order constellation, where higher SNR frequencies can bear a higher order constellation, and the resulting closer spacing of the constellation points. Frequencies with the lower SNR use lower order constellations such as QPSK.” DISH-1001, 8:24-29.

Jacobsen explains that, “[i]n multicarrier modulation, a channel is divided into N equal-bandwidth subchannels, each with its own carrier, such that the frequency response is roughly constant across each subchannel.” DISH-1007, 306. “In contrast to traditional frequency-division multiplexing (FDM) techniques, multicarrier modulation does not constrain the number of bits per subchannel to be equal for all subchannels.” *Id.*, 306-07. “Instead, **bits are originally assigned to subchannels** just after training during system initialization **in direct proportion to the subchannel signal-to-noise ratios**.” *Id.*, 307. “As a result, **subchannels that**

suffer from little attenuation and/or little noise carry the most bits, while subchannels that are severely attenuated and/or very noisy might not carry any bits." *Id.* "This property can be used to alleviate the problems caused by both frequency-domain ripple and interferers," where "[e]ach subchannel [] supports its own QAM constellation." *Id.*

Amit similarly explains that "[t]he modulation method is QPSK, QAM 16, QAM 64 or QAM 256 **according to the channel conditions**." DISH-1005, 8:30-32.

As discussed in [10.c.iii], Amit and Jacobsen both recognize how the reflections from the filter can cause frequency selective channel impairments, and as discussed above, Amit-Jacobsen renders obvious overcoming such impairments by adjusting the modulation order of each OFDM carrier.

(c) Claim 8

Amit-Jacobsen renders obvious claim 8. DISH-1003, ¶¶309-312. The '249 patent explains that "the standard cable use frequencies [] extend to 550 MHz or 750 MHz." DISH-1001, 5:28-30. And as discussed in §IV.B.4.(d), Amit renders obvious using a frequency above the cable television band.

Jacobsen also teaches using such a frequency. For example, Jacobsen explains that "[s]ome CATV networks can also have high-frequency attenuation reduced by the installation of equalizing diplex amplifiers that can **boost the**

usable spectrum to 1 GHz." DISH-1007, 305. Therefore, it would have been obvious to a POSITA that the Amit-Jacobsen system would have included a frequency for communicating that is above the cable television band, *e.g.*, 860 MHz to 1 GHz. DISH-1003, ¶315.

(d) Claim 12

Amit-Jacobsen renders obvious claim 12. DISH-1003, ¶¶313-316. As discussed in [10.c.iii], Amit-Jacobsen renders obvious "implementing a **time-domain equalizer (TEQ)**, the purpose of which is to reduce the required length of the cyclic prefix in exchange for an increase in system complexity." DISH-1007, 309.

(e) Claim 13

Amit-Jacobsen renders obvious claim 13. DISH-1003, ¶¶317-320. Jacobsen "note[s] that by using a **decision feedback equalizer (DFE) instead of a linear equalizer**, the complexity of the single-carrier system might be reduced slightly with respect to the MMSE-LE case because only the feedforward filter would need to run at the T/2 rate." DISH-1007, 310. This DFE is an example of an adaptive equalizer. DISH-1003, ¶319.

(f) Claims 14, 16

Amit-Jacobsen renders obvious claims 14 and 16. DISH-1003, ¶¶321-324. As discussed in [5.a.ii], Amit-Jacobsen renders obvious that the terminal devices

use OFDM modulation.

As discussed in claim 4, Jacobsen further renders obvious using OFDM modulation "to overcome frequency the communication channel impairments caused by the reflected signals."

D. GROUND 4: Claims 2-3, 7, 9-13, 15, 17 are Rendered Obvious by Amit, Jacobsen, and DSL-Book

1. DSL-Book Overview

"DSL: Simulation Techniques and Standards Development for Digital Subscriber Line Systems" is a textbook (hereinafter, "DSL-Book"). DISH-1008, Cover. DSL-Book was publicly available in 1998 and qualifies as prior art under at least 102(b). DISH-1022, ¶¶6-9.

DSL-Book "is a collection of simulation/implementation techniques and reference materials for the design and development of DSL systems." DISH-1008, 12. Nevertheless, DSL-Book recognizes that "[m]any techniques developed for DSLs can be very useful also for next-generation communication systems, such as a high-throughput home digital network." *Id.* DSL-Book "also can be used a reference guide" to "research studies in digital communication systems." *Id.*

The '249 patent references DSL-Book as covering "OFDM system architecture." DISH-1001, 8:55-60.

2. Amit-Jacobsen-DSL-Book Combination

A POSITA would have been motivated to incorporate into the Amit-

Jacobsen combination the: (1) OFDM techniques, (2) equalization techniques; (3) time division duplex protocol, and (4) forward error correction of DSL-Book.

(a) Motivation

A POSITA seeking to improve the coaxial cable network of Amit-Jacobsen would have been familiar with communications textbooks such as DSL-Book—an analogous reference from the same field of endeavor as the ’249 patent: communication techniques for broadband networks. DISH-1003, ¶¶329-353. All three references recognize that the Internet and consumer and entertainment services are motivators for high-speed network communications. *Id.*

A POSITA reading Amit’s and Jacobsen’s teachings would have been motivated to improve such networks with methods used in non-coaxial networks, as all three references demonstrate the overlap between coaxial and non-coaxial networks. *Id.* Unlike the prior art coaxial networking solution, which “[i]nterferes with VDSL,” Amit’s network has “[n]o interferes.” DISH-1005, 28:67. Indeed, Amit recognizes that “[t]here are several home networking solutions that have already been proposed, including networking over the existing telephone wiring …, networking over the existing power lines, … and solutions that require new wiring, such as … CAT 5 Ethernet wiring.” *Id.*, 1:31-37. Amit also acknowledges that “[h]ome networks will connect between computing devices … and modems (**such as cable modems, DSL modems**, and PSTN modems) that connect the

home outside." *Id.*, 1:18-25. A POSITA would thus be motivated to look at teachings about all types of home networks, including the copper-based networks described in ADSL/VDSL. DISH-1003, ¶332.

Jacobsen itself cites to an article titled "A Computationally Efficient Adaptive Transceiver for HighSpeed **Digital Subscriber Lines**" as providing "more information on multicarrier modulation and DMT." DISH-1007, 307, 312. Likewise, DSL-Book recognizes that "[m]any techniques developed for DSLs can be very useful also for **next-generation communication systems, such as a high-throughput home digital network**." DISH-1008, 12. DSL-Book "can be used a reference guide" to "research studies in digital communication systems." *Id.*

A POSITA would also have been motivated to combine Amit's and Jacobsen's teachings with DSL-Book because all three references seek to overcome network communication channel impairments and are reasonably pertinent to the problem the '249 patent purports to address—"providing a suitable path for terminal-to-terminal communication." DISH-1001, 3:4-7. Amit and Jacobsen are discussed in §IV.C.2.(a), and DSL-Book similarly recognizes that while "[t]he usable bandwidth of a twisted-pair telephone subscriber loop is much wider than the voice band telephony channel," "the channel distortion is also more severe for using the full available bandwidth." DISH-1008, 149. "Specifically, amplitude attenuation and phase delay could be very different at different

frequency regions within the available bandwidth." *Id.* Like Amit and Jacobsen, DSL-Book describes techniques for providing a suitable path for terminal-to-terminal communication via, *e.g.*, equalization. *See id.*, 149-50.

DSL-Book further builds upon the concepts already discussed in Amit and Jacobsen, including OFDM, equalization, TDD, and FEC, and a POSITA would have been motivated to use DSL-Book for details on implementing these concepts. DISH-1003, ¶335.

The subsections below provide further examples of the motivation to combine specific teachings of ADSL/VDSL with Amit's coaxial home network.

(i) OFDM (claims 1, 3-7, 14, 16)

A POSITA would have been motivated to improve the bit rate of Amit-Jacobsen's network using DSL-Book's OFDM modulation. DISH-1003, ¶¶337-338. As discussed in §IV.C.2.(a).(i), a POSITA would have been motivated to improve the QAM modulation of Amit to arrive at Jacobsen's single carrier QAM modulation with equalization or multicarrier modulation, both of which build upon QAM. A POSITA would have been further motivated to implement the additional OFDM teachings of DSL-Book. Like Jacobsen, DSL-Book teaches that DMT "is a multi-carrier system," where "[t]he spectrum of a DMT signal consists of many narrow bandwidth QAM-like carriers with different and equally distributed carrier frequencies." DISH-1008, 436-37. Indeed, "[e]ach multibit subchannel can use a

QAM signal constellation." *Id.*, 438.

§IV.C.2.(a).(i) also discussed how Amit and Jacobsen each recognize that reflections can cause frequency selective channel impairments, and DSL-Book addresses how to overcome communication channel impairments. DSL-Book explains that "the channel distortion can be avoided by a DMT system through the fine division of the available bandwidth into many subcarriers such that each subchannel is almost distortion free." DISH-1008, 439. Like Amit and Jacobsen, DSL-Book recognizes that "channel distortion could cause inter-subchannel interference," which "is caused by amplitude attenuation and phase delay differences between sub-channels." *Id.*, 440. DSL-Book teaches that "[o]ne way to improve the transmission efficiency … is to assign a different signal power for each subchannel" in the OFDM signal. *Id.*, 443. A POSITA would have thus been motivated to improve the modulation of Amit-Jacobsen's terminal devices using DSL-Book.

(ii) Equalization (claims 10-13)

Much like OFDM, a POSITA would have looked to DSL-Book's equalization so Amit-Jacobsen's terminal devices could more efficiently use the network. DISH-1003, ¶339. In the same section where it addresses channel distortion and OFDM, DSL-Book explains that "inter-subchannel interference can be minimized … by using a channel equalizer." DISH-1008, 440. As discussed in

§IV.C.2.(a).(i)-(ii), Amit and Jacobsen both recognize that reflections can cause frequency selective channel impairments and that frequency resources are limited, and DSL-Book similarly recognizes that the limitations of a communications channel can be overcome by using techniques such as equalization. A POSITA would have thus been motivated to add DSL-Book's equalizers to Amit-Jacobsen's terminal devices to help provide a suitable signal path for terminal-to-terminal communication.

(iii) FEC (claim 15)

A POSITA would have been motivated to look to the details of DSL-Book for ways implement the FEC of Amit. DISH-1003, ¶¶340-343.

Amit teaches that its network has "FEC (Forward Error Correction) [that] MUST support R-S (Reed Salomon)." DISH-1005, 8:40-44. DSL-Book provides additional details of such FEC, including that "Trellis and forward error correction coding techniques had been introduced in conjunction with the Discrete MultiTone (DMT) line code to improve the transmission performance under the crosstalk and impulse noise environment." DISH-1008, 428.

A POSITA also would have been motivated to use FEC to efficiently utilize the limited networking resources for the reasons described in the equalization section.

A POSITA would have thus been motivated to increase the capabilities of

Amit-Jacobsen's terminal devices by implementing DSL-Book's FEC.

(iv) TDD (claims 2, 9, 17)

Similar to FEC, a POSITA would have been motivated to look to DSL-Book for additional details of implementing the TDD. DISH-1003, ¶¶344-346. Amit teaches that "[t]here are some known methods to allocate channels for each home-network," including "TDM-Time Domain Multiplexing," which "[r]equires synchronization." DISH-1005, 26:1-45. DSL similarly teaches of duplex communications where "[t]he transmission direction can also be **time divided**: transceivers at both ends are synchronized and take turns transmitting," which "is sometimes called … **Time Division Duplex (TDD)**." DISH-1008, 91. DSL-Book also explains how to achieve such synchronization. *Id.*, 443-44.

A POSITA would thus be motivated to increase the capabilities of Amit's terminal devices by implementing DSL-Book's TDD.

(b) Reasonable Expectation of Success

A POSITA would have had a reasonable expectation that the Amit-Jacobsen-DSL-Book combination would produce a successful outcome for similar reasons to those discussed above for the combination in Ground 2 and for the reasons explained in Dr. Acton's declaration. DISH-1003, ¶¶347-353.

3. Claims 10-13

(a) Claim 10

Amit-Jacobsen-DSL-Book renders obvious independent claim 10. DISH-1003, ¶¶354-358. As discussed above, Amit-Jacobsen renders obvious claim 10, and DSL-Book's teachings further render obvious [10.c.iii]. DISH-1003, ¶¶355-358. DSL explains that "channel distortion could cause inter-subchannel interference," which "is caused by amplitude attenuation and phase delay differences between subchannels," but "[t]he inter-subchannel interference can be **minimized** by selecting a lower baud rate or **by using a channel equalizer**." DISH-1008, 440.

As described in [10.c.iii], §IV.C.3.(c), Amit and Jacobsen both recognize how the reflections from the filter can cause frequency selective channel impairments, and these impairments can be overcome using the equalization described above to restore a flat frequency response.

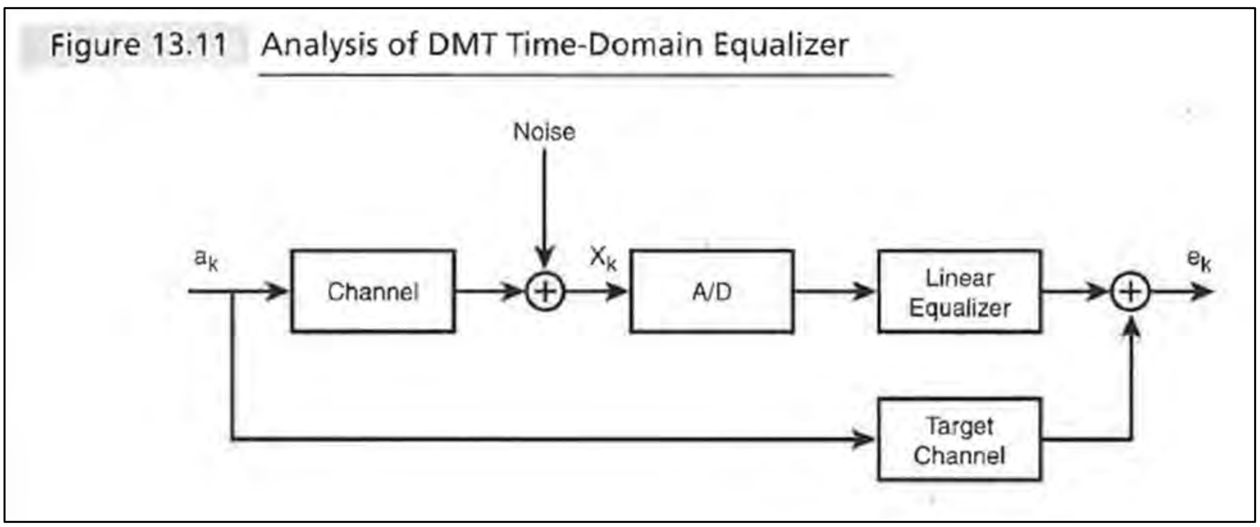
(b) Claim 11

Amit-Jacobsen-DSL-Book renders obvious claim 11. DISH-1003, ¶¶359-362. DSL-Book explains that "[t]o complete the received signal detection, a Frequency-Domain Equalizer is also required." DISH-1008, 442. "The purpose of the Frequency-Domain Equalizer (FEQ) is to correct phase and amplitude distortion of each subchannel such that a unified symbol detection mechanism can

be applied to all subchannels." *Id.*

(c) Claim 12

Amit-Jacobsen-DSL-Book renders obvious claim 12. DISH-1003, ¶¶363-366. DSL-Book explains that "[a] time domain channel equalizer is necessary for the DMT receiver to reduce the amount of channel distortion present in the subscriber loop environment." DISH-1008, 441. "A DMT Time Domain Equalizer can modify the loop channel response to the target channel response, as shown in Figure 13.11." *Id.*

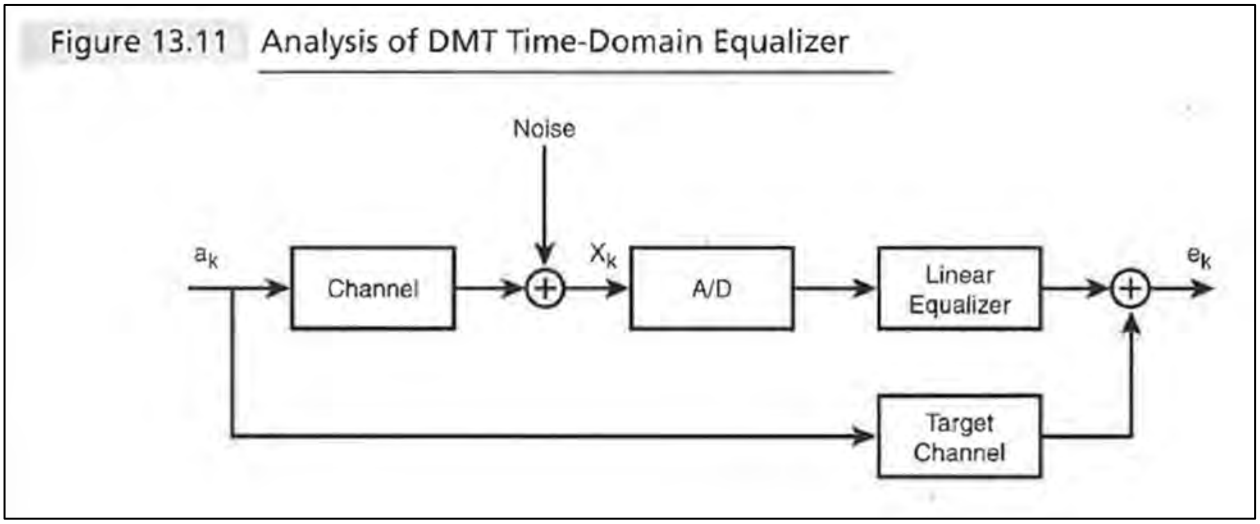


DSL-Book, FIG. 13.11.

(d) Claim 13

Amit-Jacobsen-DSL-Book renders obvious claim 13. DISH-1003, ¶¶367-371. As explained in claim 12 above, DSL-Book teaches of a "DMT Time Domain Equalizer [that] can modify the loop channel response to the target

channel response, as shown in Figure 13.11." *Id.* This equalizer is adaptive because its "coefficients are identified iteratively in real-time in frequency or time domain." *Id.*



DSL-Book, FIG. 13.11.

4. Claims 2, 3, 7, 9, 15, 17

(a) Claims 2, 9, 17

Amit-Jacobsen-DSL-Book renders obvious claims 2, 9, and 17. DISH-1003, ¶¶372-376.

Amit renders obvious claim 2 as described in §IV.A.2.(b).

DSL-Book similarly teaches of duplex communications where "transmission was carried out only in one direction … at a given time," so the transmission direction is "regulated through some handshake protocol whenever a transceiver at one end has data to transmit." DISH-1008, 91. In such duplex communications,

"[t]he transmission direction can also be **time divided**: transceivers at both ends are synchronized and take turns transmitting," which "is sometimes called … **Time Division Duplex (TDD)**." *Id.*

DSL-Book further teaches broadcasting a beacon message on the network to synchronize communications using a "pilot tone." DSL-Book explains "[t]he clock synchronization between a DMT transmitter and a DMT receiver is maintained through a timing recovery circuit in at least one transmission direction." *Id.*, 443. "The timing recovery circuit of a DMT system involves **the transmission of a pilot tone** at the clock source end and the recovery of the pilot tone at the other end." *Id.* And DSL-Book teaches this pilot tone is a beacon message by describing it as "a subcarrier **dedicated only for the purpose of timing recovery**" where "[t]he transmit power … may actually be more than the nominal transmit power of the information bearing subcarriers." *Id.*, 443-44.

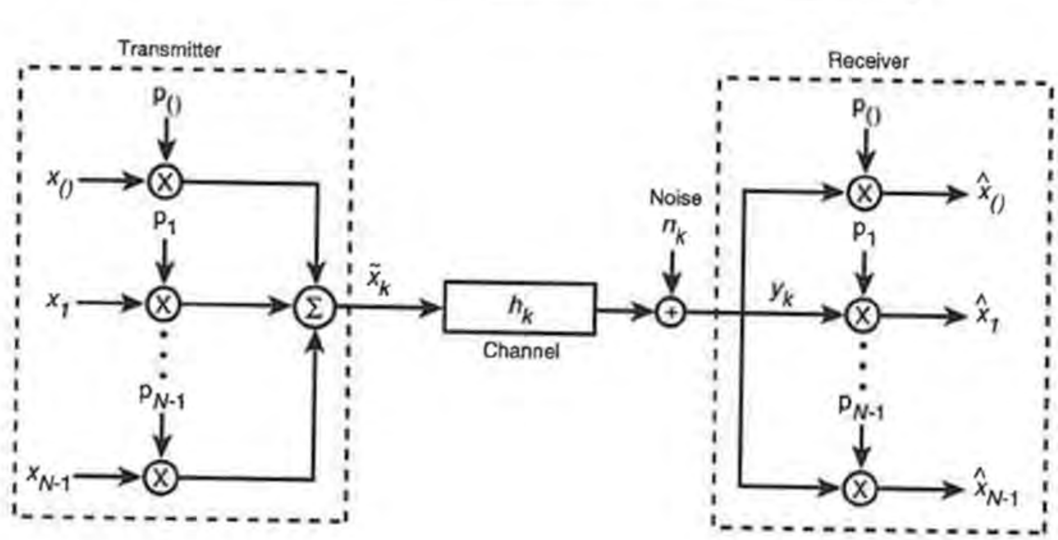
(b) Claims 3, 7

Amit-Jacobsen-DSL-Book renders obvious claims 3 and 7. DISH-1003, ¶¶377-384. As discussed in [5.a.ii], §IV.C.3.(b), Amit-Jacobsen renders obvious that each terminal device communicates with other terminal devices using OFDM modulation.

DSL-Book also teaches of using OFDM. For example, DSL-Book teaches of using "Discrete MultiTone (DMT) line code to improve the transmission

performance under the crosstalk and impulse noise environment." DISH-1008, 428. "The DMT line code is a multi-carrier system," where "[t]he spectrum of a DMT signal consists of many narrow bandwidth QAM-like carriers with different and equally distributed carrier frequencies," as shown in Figure 13.7:

Figure 13.7 Simplified Illustration of DMT Transceiver and Channel



DSL-Book, 436-37, FIG. 13.7.

DSL-Book further teaches that, "[b]ased on the Signal to Noise Ratio (SNR) of each subchannel, the number of bits that can be transmitted through each subchannel for certain error probability can be calculated as follows:"

$$\boxed{b_j = \log_2\left(1 + \frac{SNR_j}{\Gamma}\right)}$$

DISH-1008, 442. "The SNR_j is expressed in power ratio," where "Γ for an error rate of 10^{-7} is 9.8 dB or 9.55 in terms of power ratio." "One way to **improve the transmission efficiency** with integer number of bits is to **assign a different signal power for each subchannel**." *Id.*, 443. "Up to 1 dB of performance improvement can be achieved by using these advanced loading algorithms." *Id.*

As discussed in [10.c.iii], §IV.C.3.(c), Amit and Jacobsen each recognize how the reflections from the filter can cause frequency selective channel impairments, and as described above, Amit-Jacobsen-DSL-Book teaches how to overcome these impairments by adjusting the power level of each OFDM carrier according to the signal loss at each OFDM carrier frequency.

(c) Claim 15

Amit-Jacobsen-DSL-Book renders obvious claim 15. DISH-1003, ¶¶385-389.

As discussed in §IV.B.4.(l), Amit teaches of using FEC.

DSL-Book also teaches of using FEC with DMT to improve transmission. DISH-1008, 428. Like the '249 patent, DSL-Book also teaches of using known FEC types. *Compare id.*, 446 *with* DISH-1001, 8:44-47 (both explaining Reed-Solomon coding).

V. DISCRETION SHOULD NOT PRECLUDE INSTITUTION

The USPTO is currently evaluating claim 10 of the '249 patent in

Reexamination No. 90/019,247 filed by Unified Patents, LLC ("Unified") on September 11, 2023 (the "Reexamination"). The Board should decline to exercise its discretionary authority to deny institution under §314(a) and §325(d) because:

- DISH has no affiliation with Unified;
- this Petition challenges 16 additional claims; and
- this Petition relies on references and grounds that the USPTO has not considered and will not consider during the Reexamination.

A. The *General Plastic* Factors Favor Institution—§314(a)

1. Factor 1: DISH Never Petitioned This Patent

Unlike the precedential *Valve* cases, DISH and Unified are distinct entities with no significant relationship. *Valve Corp. v. Electronic Scripting Prods., Inc.*, IPR2019-00062, Paper11 at 10 (PTAB Apr. 2, 2019) (precedential); *Valve Corp. v. Electronic Scripting Prods., Inc.*, IPR2019-00064, Paper10 at 11 (PTAB May 1, 2019) (precedential). DISH has certified that no other party influenced its petition. *See* §VIII.A. DISH did not replicate any of the Reexamination, and unlike Unified, DISH is facing infringement allegations. The facts thus compare favorably to decisions granting institution following a Unified filing. *E.g.*, *Apple Inc. v. Uniloc 2017 LLC*, IPR2019-01667, Paper7 at 7-8 (PTAB Apr. 21, 2020); *Apple Inc. v. Gesture Tech. Partners, LLC*, IPR2021-00920, Paper12 at 23-25 (PTAB Dec. 6, 2021); *Mercedes-Benz USA, LLC v. Carucel Investments, LP*, IPR2019-01404, Paper12 at 12 (PTAB Jan. 22, 2020); *Netflix, Inc. & Hulu, LLC, v. DivX, LLC*,

IPR2020-00052, Paper36 at 2-3 (PTAB, May 13, 2020).

2. Factors 2, 4, and 5: DISH Filed with Reasonable Diligence

Petitioner searched for prior art and filed this Petition eleven months after being sued, all while developing defenses against the eleven other patents in the co-pending Litigation.[10] Petitioner's independently uncovered Amit, which supports strong motivation rationales with ADSL/VDSL, Jacobsen, and DSL-Book.

When the Reexamination was filed on September 11, Petitioner was still vetting the prior art and worked diligently on refining Grounds 1-4 in the intervening months. Petitioner's timing and diligence was reasonable under the circumstances and did not result in unfair tactical advantages.

3. Factor 3: Road-Mapping Is Impossible

This Petition precedes any Patent Owner response in the Reexamination, so road-mapping is impossible.

4. Factors 6 and 7: The Board's Resources Are Well-Spent Here

All references but Amit are distinct from the Reexamination, and while this Petition utilizes Amit in distinct grounds and attacks all 17 claims, the Reexamination only challenges claim 10. The Petition is also narrowly tailored to allow for a Final Written Decision ("FWD") within one year.

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[10] Case 2:23-cv-1043-JWH-KES (NDCAL), per §VIII.B, *infra*.

B. The *Advanced Bionics* Test Favors Institution—§325(d)

The petition's references were not considered during prosecution and are not cumulative of the references considered. Although ADSL/VDSL and DSL-Book were cited in the '249 patent's specification, they were not substantively evaluated by the Examiner. *See Scientific Design Co. v. Shell Oil Co.*, IPR2021-01537, Paper7 at 24-26 (PTAB 2022) and IPR2022-00158, Paper7 at 24-26 (PTAB 2022) (granting institution despite Examiner initialing the asserted art on IDS); *Fox Factory, Inc. v. SRAM, LLC*, IPR2016-01876, Paper8 at 7-9 (PTAB 2017) (refusing to deny institution where reference cited but not considered at length). And while the Reexamination relies on Amit, this Petition utilizes Amit in distinct combinations and attacks all the '249 patent's claims, while the Reexamination targets only claim 10, relies on different secondary references, and is in its infancy. This Petition thus does not involve the same or substantially the same art or arguments previously presented.

C. The *Fintiv* Factors Favor Institution—§314(a)

Institution is consistent with the Director's guidance on applying the *Fintiv* Factors. *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper11 (PTAB Mar. 20, 2020) (precedential) ("*Fintiv*"); *Memorandum: Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation* (June 21, 2022) ("*Director's Guidance*"). A holistic analysis of the

Fintiv framework favors institution. *Fintiv*, 6.

1. Factor 1: Institution Supports Staying Parallel Proceedings

Institution would enable the Board to determine validity and allow the District Court to stay several litigations involving the ’249 patent. Petitioner will seek a stay, and the opportunity for simplification increases the likelihood the court will grant a stay in view of IPR institution. *C.R. Laurence Co., Inc. v. Frameless Hardware Co., LLC*, 2:21-cv-01334-JWH-RAO (CDCA, Dec. 9, 2022); *Guy A. Shaked Investments, Ltd. et al. v. Trade Box, LLC*, 2:19-cv-10593-AB-MAA (CDCA, Nov. 18, 2020); *Masimo Corp. v. Apple Inc., 8:20-cv-00048-JVS-JDE* (CDCA, Oct. 13, 2020); (all granting motions to stay pending IPRs).

2. Factor 2: The Board’s FWD Will Likely Issue Before Any Foreseeable Trial

The District Court case was filed on February 10, 2023, but due to multiple motions to dismiss, DISH did not answer until September 21, 2023. The trial date has not been set, and the median time to trial in CDCA for all civil cases is 28.4 months. DISH-1024. For patent cases, that number increases to **34.4 months**. DISH-1026. The July 2025 anticipated FWD would thus precede a median time-estimated trial date in December 2025. Indeed, the District Court set a Claim Construction Hearing for September 17, 2024 and may adjust its schedule to ensure a trial date after FWD. DISH-1025.

This factor thus favors institution. And even if it did not, "the proximity to trial should not alone outweigh" other factors. *Director's Guidance*, 8.

3. Factor 3: Petitioner's Diligence Outweighs the Parties' Investment in the Litigation

The District Court proceeding is in an early state, and investment has been minimal. Indeed, the court has not resolved whether venue is proper, issued a full schedule, or set a trial date, and claim construction briefing will not begin until July. DISH-1025.

Patent Owner asserted twelve patents, but only ten remain after resolution of DISH's motion to dismiss. Further, Patent Owner's September 2023 infringement contentions first disclosed all asserted claims, and DISH diligently worked to prepare this Petition significantly before its bar date. This factor thus favors institution. *See, e.g.*, *Apple Inc. v. Seven Networks LLC*, IPR2020-00156, Paper10 at 11-12 (PTAB Jun. 15, 2020); *Sotera*, 16-17; *Mylan*, IPR2018-01680, Paper22 at 18.

4. Factor 4: The Petition Raises Unique Issues

DISH asks the Board to consider the petition's unique grounds, including claims 1-9, 11-12, and 14-16, which are not asserted against DISH in the district court. *See Fintiv*, 12-13. If the Board institutes, DISH will not pursue district court invalidity challenges based on the same grounds pursuant to 35 U.S.C.

§315(e), thereby eliminating risk of duplicated efforts.

5. Factor 5: DISH's Involvement in Parallel Proceedings

The parties are the same in this IPR and the District Court proceeding.

6. Factor 6: The Merits Support Institution

The *Fintiv* factors "are part of a balanced assessment of all the relevant circumstances in the case," and "if the merits of a ground raised in the petition seem particularly strong…the institution of a trial may serve the interest of overall system efficiency and integrity." *Fintiv*, 14-15. The grounds raised here are strong, and institution will likely result in invalidation of all claims.

VI. FEES—37 C.F.R. §42.103

Petitioner authorizes the USPTO to charge Deposit Account No. 06-1050 for the fee set in 37 C.F.R. §42.15(a) for this Petition and authorizes this Account to be charged for any additional fees.

VII. CONCLUSION

Petitioner respectfully requests institution of IPR and cancellation of all Challenged Claims.

VIII. MANDATORY NOTICES—37 C.F.R §42.8(a)(1)

A. Real Party-In-Interest—37 C.F.R. §42.8(b)(1)

DISH Network L.L.C. is petitioner and real party-in-interest. Dish Network Service L.L.C., DISH Network Corporation, and Dish Network California Service Corporation are additional real parties-in-interest. No other party had access to or

control over the filing of this Petition, and Petitioner did not file this Petition for the benefit of any other party or entity.

B. Related Matters—37 C.F.R. §42.8(b)(2)

Other than the ’249 Reexamination discussed above, Petitioner is not aware of any disclaimers, reexamination certificates, or petitions for *inter partes* review for the ’249 patent.

Petitioner is aware of the following civil actions involving the subject matter for the ’249 patent.

Case Number	Filing Date
Entropic Communications, LLC v. DirecTV, LLC f/k/a DirecTV, Inc. et al., 2-23-cv-05253 (CDCA)	July 1, 2023
Entropic Communications, LLC v. DISH Network Corporation et al., 2-23-cv-01043 (CDCA)	February 10, 2023
Entropic Communications, LLC v. Cox Communications, Inc. et al., 2-23-cv-01047 (CDCA)	February 10, 2023
Entropic Communications, LLC v. Comcast Corporation et al., 2-23-cv-01048 (CDCA)	February 10, 2023
Entropic Communications, LLC v. Charter Communications, Inc., 2-23-cv-00050 (EDTX)	February 10, 2023
Entropic Communications, Inc. v. ViXS Systems, Inc. et al., 3-13-cv-01102 (SDCA)	May 8, 2023

C. Lead And Back-Up Counsel Under 37 C.F.R. §42.8(b)(3)

Petitioner provides the following designation of counsel.

Lead Counsel	Backup counsel
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D. Service Information

Please address all correspondence and service to the address listed above.

Petitioner consents to electronic service by email at IPR45035-0036IP1@fr.com.

Respectfully submitted,

Dated: January 16, 2024

/Adam R. Shartzer/
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CERTIFICATION UNDER 37 CFR §42.24

Under the provisions of 37 CFR §42.24(d), the undersigned hereby certifies that the word count for the foregoing Petition for *Inter partes* Review totals 13,998 words, which is less than the 14,000 allowed under 37 CFR §42.24.

Dated: January 16, 2024

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CERTIFICATE OF SERVICE

Pursuant to 37 CFR §§42.6(e)(4)(i) *et seq.* and 42.105(b), the undersigned certifies that on January 16, 2024, a complete and entire copy of this Petition for *Inter partes* Review, Power of Attorney, and all supporting exhibits were provided via Federal Express, to the Patent Owner by serving the correspondence address of record as follows:

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